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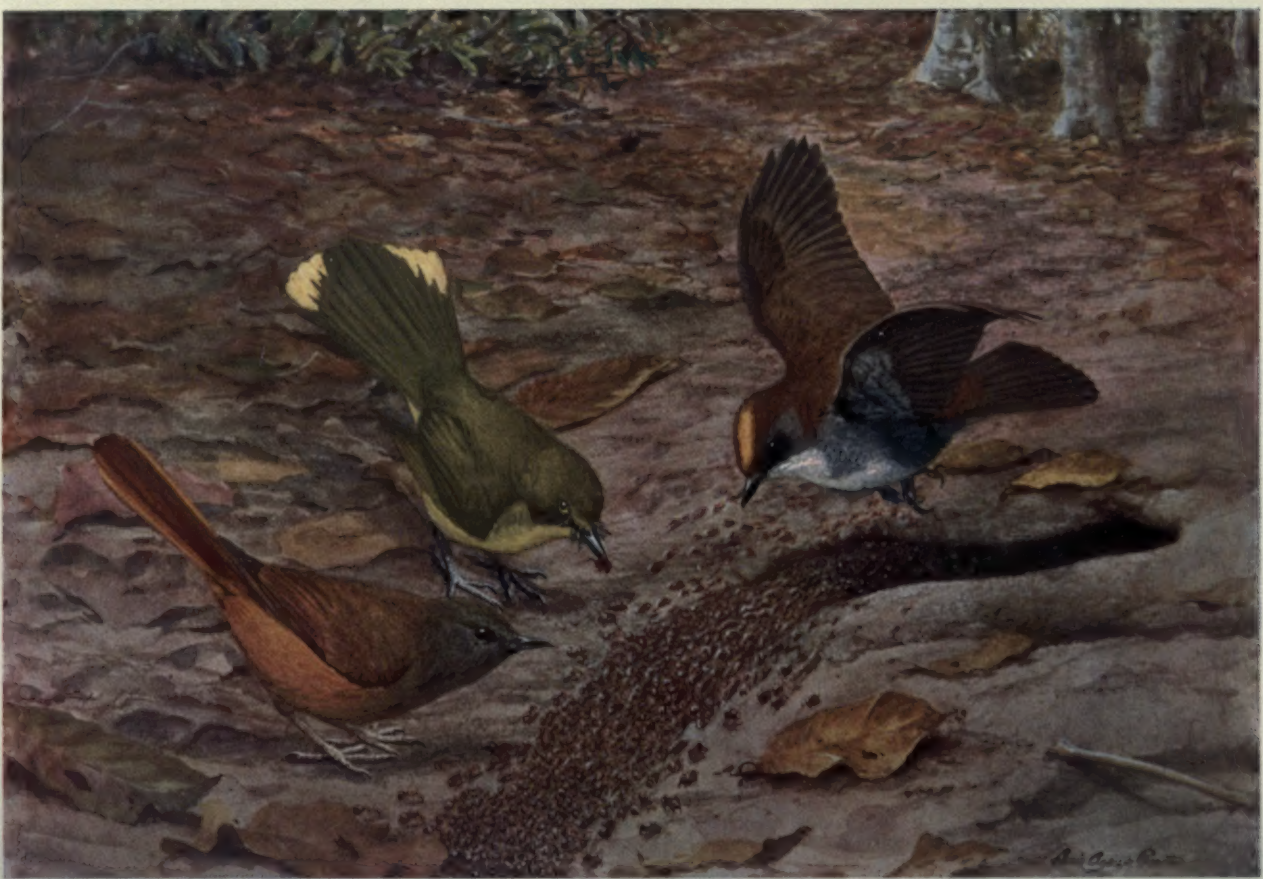

Three common driver-ant birds of the Ituri Forest: *Alethe castanea woosnami* Grant (Fig. 1), *Neocossyphus rufus gabunensis* Neumann (Fig. 2), and *Bleda eximia ugandæ* van Someren (Fig. 3), following a column of *Dorylus* (*Anomma*) *wilverthi* Emery.

BULLETIN

OF

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VOLUME XLV, 1921-1922

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ERRATA

Page 11, line 10 from bottom, for var. *santschii* read var. *santschiellum*.
“ 11, at end of list of new forms insert *Dorylophila schwabi* (Efulen to Elat, Cameroon), p. 626; and *Ocyplanus kohli* var. *niger* (Mful Aja, Cameroon), p. 627.
“ 18, first line, for mend read ment.
“ 21, line 7 from top, for var. *molesta* read var. *molestus*.
“ 27, twelfth name from top, for *Pseudatta* read *Pseudoatta*.
“ 39, line 18 from bottom, for *Ecitini* read *Ecitonini*.
“ 40, line 11 from top, for *Ecitini* read *Ecitonini*.
“ 52, line 15 from top, for *Cerapachyniæ* read *Cerapachyinæ*.
“ 125, lines, 15, 16, and 21 from top, insert article "I" before verb "have."
“ 125, lines 17 and 19 from top, for *Pheidologetini* read *Pheidologetonini*.
“ 125, line 22 from top, for *Dacetini* read *Dacetonini*.
“ 165, line 9 from bottom, p. 167, line 11 from bottom, and p. 168, line 10 from top, for *nossindambo* read *nosindambo*.
“ 170, line 12 from top, for *Pheidologetini* read *Pheidologetonini*.
“ 202, line 10 from top, for *okiavoënsis* read *okiavoënse*.
“ 226, line 8 from top, for *annectans* read *annectens*.
“ 233, line 3 from top, strike out "*Myrmothrix* (one species, probably introduced)." This species, *C. immigrans* Santschi, is now placed in the subgenus *Dinomyrmex*.
“ 260, line 20 from top, insert "of" between species and *Myrma*.
“ 281, line 4 from bottom, for Krober read Kröber.
“ 316, line 6 from bottom, for extensive read extensile.
Explanation of Pl. XXII, line 2 from bottom, for emited read emitted.

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OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

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Article I.—ANTS OF THE AMERICAN MUSEUM CONGO EXPEDITION. A CONTRIBUTION TO THE MYRMECOLOGY OF AFRICA[1]

BY WILLIAM MORTON WHEELER

WITH THE COLLABORATION OF J. BEQUAERT, I. W. BAILEY, F. SANTSCHI, AND W. M. MANN

PLATES I TO XLV, 47 MAPS, AND 103 TEXT FIGURES

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[1] Scientific Results of the American Museum Congo Expedition. Entomology No. 7.

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INTRODUCTION

The present volume has grown out of a study of the ants collected by the American Museum Congo Expedition, under the direction of Messrs. Herbert Lang and James P. Chapin, and of a smaller collection made in the same region by Dr. J. Bequaert. The working up of this material has proved to be far from easy, owing to the state of the literature on the African Formicidæ. During the nineteenth century comparatively little work was done on the ants of the dark continent, but during the past two decades, as a result of numerous expeditions and the interest of resident entomologists, Emery, Forel, Santschi, and Arnold, but especially Forel and Santschi, have published a great number of papers dealing with fragments of the Ethiopian fauna. This literature proved to be quite unmanageable until I had carefully catalogued the numerous described species, subspecies, and varieties. After this had been accomplished it seemed best to publish the results as an aid to future students. Getting the catalogue ready for publication, however, was a very annoying task, which I could hardly have undertaken without the assistance of Dr. Bequaert, who patiently verified all the numerous references, added others, and helped in arranging the synonymy and lists of localities. He has also given me the benefit of his expert opinion in regard to many taxonomic details.

Both Mr. Lang and Dr. Bequaert have, in fact, showed such keen and enthusiastic interest in the progress of the work that it seemed advisable to expand it by the addition of other matter of interest not only to the zoologist but to the general public. This, however, required the services of several collaborators. At my request, Dr. F. Santschi kindly undertook to work up the species of *Crematogaster*, a genus to which he has given much attention. A glance at my catalogue of the Ethiopian species will show why I despaired of adequately handling the Congo material of the group. I might have attempted it, if the *Crematogaster* portion of Mr. George Arnold's monograph of the Rhodesian ants had appeared, but the World War had stopped the publication of this important work, so that even in making my catalogue I had nothing to rely on except the confused mess in the existing literature. Mr. Arnold nevertheless sent me some valuable comments on several of the species, together with the following remarks on the genus as a whole: "The genus *Crematogaster* is perhaps the most troublesome of all, and for this there are several reasons. First of all, it is a very large genus, so large that authors get lost in the vast number of described forms and of their collections. Secondly, the species of this genus in Africa are exceptionally liable to minute variations in all directions even over a very small area (one might almost say 'on a very small number of adjacent trees,' since most of the species are arboricolous), and even within the limits of the same nest. This is a point which can only be properly appreciated by the man on the spot, and is persistently overlooked by the cabinet naturalist. Thirdly, in the separation of species and varieties, too much emphasis has been placed on unreliable characters, such as the length and degree of divergence of the epinotal spines, the strength of the median mesonotal tubercle, and the proportions of the petiole. Lastly, a good deal of confusion is due to sheer carelessness and contempt for exact methods." Other almost equally baffling and disconcerting complexes of forms are presented by *Camponotus* (*Myrmoturba*) *maculatus* (Fabricius) and *C.* (*Myrmotrema*) *foraminosus* Forel and their numerous subspecies and varieties. My catalogue of these probably has little value except as a record of present taxonomic confusion.

It seemed advisable to include in the work dichotomic tables for the identification of the known genera and subgenera of ants. In constructing these tables I have also been greatly aided by Dr. Bequaert. In drawing up those of the subfamilies Ponerinæ, Cerapachyinæ, Dorylinæ, and Dolichoderinæ, extensive use was made of Emery's fascicles in Wytsman's 'Genera Insectorum.' We have, of course, added brief diagnoses of all the genera and subgenera since published. As the publication of the fascicles on the Myrmicinæ and Formicinæ was rendered impossible by the German occupation of Belgium, we were compelled to create tables for these two subfamilies from such materials as we could find in the literature and from a study of representative species in my collection. This portion of the tables is, therefore, less satisfactory and may need modification when Emery's account of the Myrmicinæ and Formicinæ appears.

Among the collections made by Messrs. Lang, Chapin, and Bequaert, there was also considerable material representing portions of the singular plants (myrmecophytes) regularly inhabited by some of the Congolese ants. As Dr. Bequaert, during his sojourn in equatorial Africa, had made many detailed notes and drawings on the relations of ants to plants, he was requested to write an article on myrmecophytism. My colleague, Prof. I. W. Bailey, undertook to study the histology of the plants under discussion and reached such striking and important conclusions, both botanical and zoological, that there could be no doubt about the propriety of including his paper as a portion of the report.

After much of the taxonomic work had been completed, Dr. Bequaert discovered that additional ant material could be obtained from the stomachs of the numerous frogs and toads collected on the expedition, and Mr. G. K. Noble kindly went over all the Congo amphibians and cut out and labelled their stomachs. Among the ants, which were in a surprisingly good state of preservation, there were many interesting forms, notably representatives of the genera *Phrynoponera*, *Psalidomyrmex*, and *Leptogenys*, not taken by the collectors in the field. The results of this study suggested the writing of a special compilation by Dr. Bequaert on ants as the food of other animals. In future it will be advisable for collectors of ants in the tropics carefully to examine the stomach contents of all batrachians as well as those of ant-eaters.

The Lang-Chapin-Bequaert collection also contained a few striking myrmecophiles which I have described in a special chapter together with an account of an interesting collection of myrmecophilous beetles made for me by Mr. George Schwab in the Cameroon. In writing this part I have had the assistance of Dr. W. M. Mann, to whom the new species of Staphylinidæ are to be attributed.

I would express to the authorities of The American Museum of Natural History my deep appreciation of their kindness in enabling me to add to the interest of the volume by including in the text the many figures drawn by Mrs. Helen von Ziska, the maps of distribution, and especially the colored frontispiece by Mr. L. A. Fuertes and the reproductions of Mr. Lang's beautiful photographs of Congolese ant-nests. I trust that in its present form the work will not only prove to be valuable as an account of the Formicidæ collected by the first American expedition to the Congo, but will also serve as a book that can be profitably taken into the field by future collectors throughout the Ethiopian Region.

A list including the various localities in which Messrs. Lang, Chapin, and Bequaert collected the material treated in my taxonomic review precedes the Catalogue of Ethiopian ants.

WM. M. WHEELER

NEW SPECIES, SUBSPECIES, AND VARIETIES, WITH THEIR TYPE LOCALITIES

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In addition, the following new names are proposed in this paper:

Phyracaces santschii Wm. M. Wheeler, p. 56; for *Phyracaces foreli* Santschi ♀, 1915: not *Phyracaces foreli* Santschi, ☿, 1914.

Platythyrea cribrinodis var. *brevidentata* Wm. M. Wheeler, Part VIII; for *Platythyrea cribrinodis* var. *punctata* Arnold, 1915; not *Platythyrea punctata* (F. Smith), 1858.

Monomorium modestum var. *smutsi* Wm. M. Wheeler, Part VIII; for *Monomorium modestum* var. *boerorum* Santschi, 1915; not *Monomorium minutum* subsp. *boerorum* Forel, 1910.

Monomorium salomonis subsp. *subopacum* var. *santschii* Wm. M. Wheeler, Part VIII; for *Monomorium salomonis* subsp. *subopacum* var. *senegalense* Santschi, 1913; not *Monomorium senegalense* Roger, 1862.

Œcophylla crassinoda Wm. M. Wheeler, p. 227; for *Œcophylla brevinodis* Wheeler, 1914; not *Œcophylla brevinodis* Ern. André.

Polyrhachis militaris subsp. *cupreopubescens* var. *dido* Wm. M. Wheeler, p. 261; for *Polyrhachis militaris* subsp. *cupreopubescens* var. *argentatus* Stitz, 1910; not *Polyrhachis argentatus* (F. Smith), 1858.

Pholeomyrmex Wm. M. Wheeler, p. 162: subgenus of *Monomorium* with *Monomorium rothsteini* Forel as the type.

I.—ON THE DISTRIBUTION OF THE ANTS OF THE ETHIOPIAN AND MALAGASY REGIONS

By Wm. M. Wheeler

The Peculiarities of the Ethiopian Ant-Fauna

Owing to the great number of genera and species of ants occurring in Africa south of the Sahara and in Madagascar and the pronounced differences between the two faunas, it will be conducive to clearness if we regard the Ethiopian and Malagasy as representing distinct "Regions," with the limits usually assigned to them by zoögeographers and by the other contributors to the "Scientific Results of the Congo Expedition." For the same reasons, I have listed the Malagasy fauna separately (Part IX). Table I is introduced as a general background for the discussion of the two faunas. It shows the distribution as determined up to date for all the known genera of Formicidæ. A cross is used to indicate the presence; a dot, the absence of a genus; and an S, its occurrence only in the southern portion of a given region. The main data of this table are condensed in numerical form in Tables II and III, the former giving the total number of genera and the number of endemic genera in each region and the number common to the other regions, the latter the total number of genera and number of endemic genera in each of the subfamilies of Formicidæ. A comparison of the figures brings out the following facts.

1.—The total number of Ethiopian genera (90, or 33.5% of the 269 known genera), though but little in excess of the number of Papuan (81) and Australian genera (81), is greater than that of any other region, except the Indomalayan (101) and Neotropical (97).

2.—The number of indigenous, or precinctive, Ethiopian genera (34, or 38%) is decidedly greater than in any other region, except in the Neotropical (48, or 51%).

3.—The Ethiopian fauna has more genera (48) in common with the Indomalayan than with any other region, though it has 34 in common with the Malagasy, 39 with the Papuan, and 34 with the Australian.

4.—The Ethiopian fauna has fewer genera in common with the Neotropical (22) than with any other region, except the Nearctic (19). This is important in connection with the theories of a former land-connection between Africa and South America, and is still further emphasized by the fact that most of the 22 common genera are those of cosmopolitan, or "tramp," species.

From Table III the following conclusions may be drawn.

1.—The Ethiopian fauna possesses a larger number of ponerine and cerapachyine genera (33) than any other region, though few more than the Indomalayan (31), Papuan (27), Australian (26), and Neotropical (28). The number of endemic ponerine genera in the Ethiopian (15) is much higher than in any other region, except the Neotropical with 12. Since the Ponerinæ are the oldest and most primitive of existing ants we are justified in attributing a high degree of antiquity to the Ethiopian fauna.

2.—This fauna possesses a greater representation of doryline genera (3) than in any region, except the Indomalayan, which has the same number.

3.—In pseudomyrmine and myrmicine genera the Ethiopian Region, with 38 genera, is inferior only to the Neotropical with 51 genera.

4.—In having only 4 dolichoderine genera the Ethiopian Region is inferior to all the regions, except the Malagasy, which has only 2 genera.

5.—In formicine genera the Ethiopian (12), is superior to other regions, except the Indomalayan (18), Papuan (12), and Australian (17). It has, however, only three endemic genera as compared with 7 in the Indomalayan, 7 in the Australian, and 4 in the Neotropical.

The differences between the various regions in the number of endemic genera is still further emphasized by the fact that the Palearctic has only 13 endemic myrmicine genera. These are nearly all parasitic, and the only endemic genus of the Nearctic, apart from 4 parasitic myrmicine genera, is *Myrmecocystus!*

The Ethiopian fauna comprises 10 cosmopolitan genera (*Ponera*, *Pheidole*, *Crematogaster*, *Monomorium*, *Solenopsis*, *Leptothorax*, *Tetramorium*, *Tapinoma*, *Prenolepis*, and *Camponotus*), 7 tropicopolitan genera (*Cerapachys*, *Platythyrea*, *Euponera*, *Leptogenys*, *Anochetus*, *Odontomachus*, and *Cardiocondyla*), and 7 paleotropical genera (*Phyracaces*, *Bothroponera*, *Tetraponera*, *Oligomyrmex* (Map 1), *Technomyrmex*, *Plagiolepis*, and *Polyrhachis*).

The most striking features of the Ethiopian fauna, however, are revealed in a consideration of the number of species and of their peculiarities in the various genera. Owing to the abundant and rapid publication of myrmecological literature within recent years, I am not prepared to give an accurate up-to-date enumeration of the species described for the different zoögeographical regions. Table IV gives the number described down to 1911, as compiled by Prof. Forel.[1] Fully a thousand forms, mainly from the Ethiopian, Indomalayan, and Neotropical Regions, must have been described since this estimate was made, so that its value for the purposes under discussion is not very great. The Ethiopian species, subspecies, and varieties described down to 1920 are recorded in the list beginning on p. 31, and their number is given in the accompanying table (Table V).

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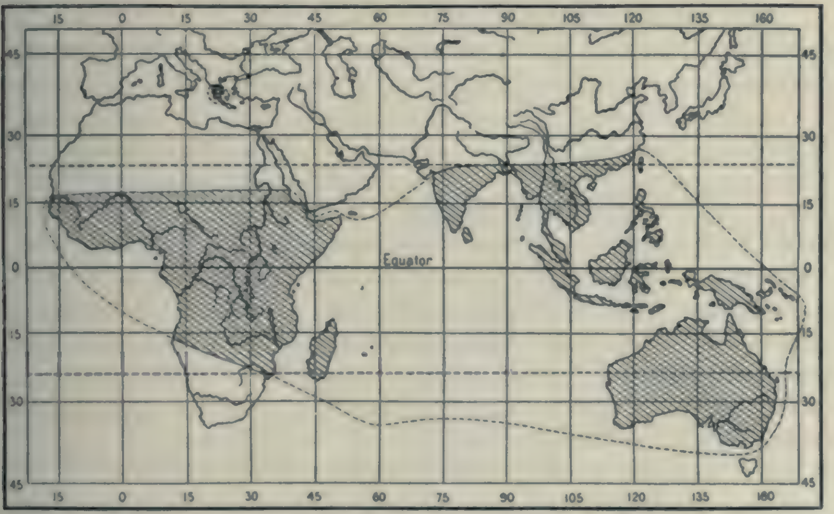
[1] 1911, 'Aperçu sur la distribution géographique et la phylogénie des fourmis.' 1er Congr. Intern. Entom. Bruxelles, (1910), II, Mém., pp. 81–100.

The ponerine and cerapachyine genera confined to the Ethiopian Region are the following: *Xymmer*, *Probolomyrmex*, *Escherichia*, *Pseudosphincta*, *Streblognathus*, *Paltothyreus*, *Glyphopone*, *Leptopone*, *Megaponera*, *Ophthalmopone*, *Phrynoponera*, *Asphinctopone*, *Plectroctena*, *Psalidomyrmex*, and *Cacopone*. The species of several of these and other genera (*Bothroponera*, *Phrynoponera*, *Streblognathus*, *Paltothyreus*, *Megaponera*, *Ophthalmopone*, *Plectroctena*, and *Psalidomyrmex*) are large, black or dark brown ants, highly predatory and termitophagous, which correspond ethologically with the species of *Myrmecia*, *Bothroponera*, and *Rhytidoponera* in Australia, of *Diacamma*, *Odontoponera*, and *Bothroponera* in the Indomalayan, and of *Dinoponera*, *Paraponera*, *Emeryella*, *Ectatomma*, *Pachycondyla*, and *Neoponera* in the Neotropical Region. An interesting negative peculiarity is the absence in Africa of the whole tribe Ectatommini, which is represented by numerous species of the genera *Rhytidoponera*, *Chalcoponera*, *Paranomopone*, and *Wheeleripone* in the



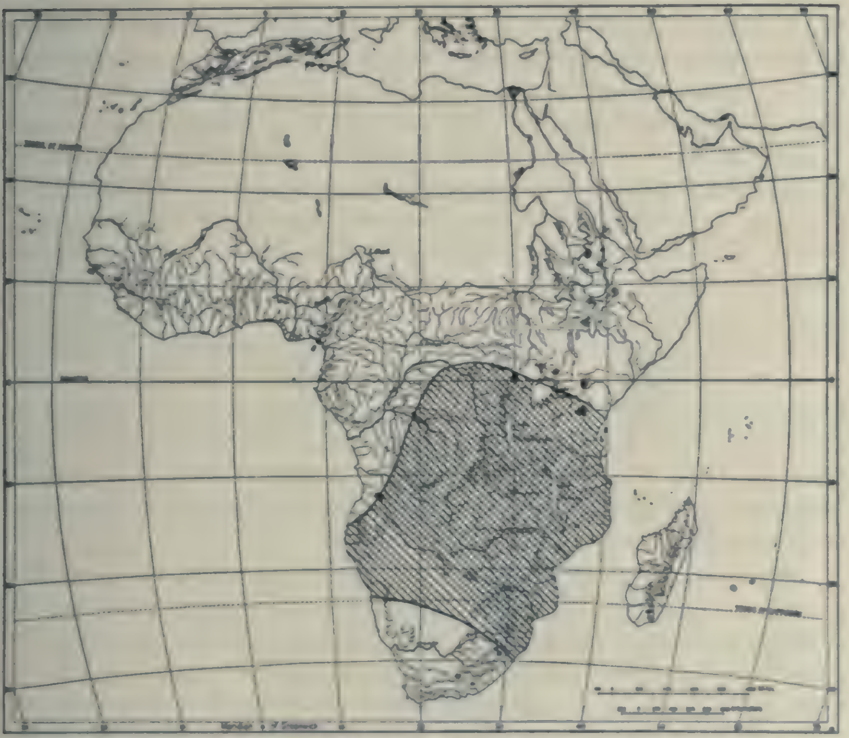
Map 1. Distribution of *Oligomyrmex*, a genus distributed over the tropics and subtropics of the Old World.

Australian and Papuan, and by species of *Stictoponera* in the Indomalayan, and of *Ectatomma* and *Emeryella* in the Neotropical Region.

A fact not brought out in the foregoing tables is the great development of the doryline genera in the Ethiopian Region. All the subgenera of *Dorylus* but one (*Dichthadia*) are represented, some of them by numerous species (*Dorylus, sens. str.*; *Anomma*). The genus *Ænictogiton*, known only from male specimens, is peculiar to Africa. The genus *Ænictus*, however, though well represented in Africa, has more numerous species in the Indomalayan Region and extends to China, Philippines, and northern Queensland. The genus *Dorylus* is represented by very few species in India and Indonesia.

The following 14 genera of Pseudomyrminæ and Myrmicinæ are peculiar to the Ethiopian Region: *Viticicola*, *Pachysima*, *Cratomyrmex*, *Anergatides*, *Diplomorium*, *Bondroitia*, *Atopomyrmex*, *Atopula*, *Macromischoides*, *Ocymyrmex*, *Tetramyrma*, *Rhoptromyrmex*, *Decamorium*, and *Microdaceton*, nearly all of them monotypic or represented by few species. The remarkable peculiarities of the myrmicine fauna come out strongly in the composition of genera common to the Ethiopian and other regions. Thus, *Myrmicaria*, though extending to the Philippines and Indonesia, is represented by the largest and most numerous species in equatorial and South Africa. *Cataulacus* is also represented by more and larger species than in the Malagasy and Indomalayan Region, *Crematogaster* by numerous subgenera, a few of which (*Nematocrema*, *Sphærocrema*) are endemic, and by a much greater number of species, subspecies, and varieties than any other region except, perhaps, tropical America. *Monomorium*, too, comprises more forms in Africa than are met with anywhere else, with the possible exception of Australia, which contains a considerable number of undescribed species. *Pheidole* is represented by many species with a peculiar African habitus and especially by the great development of the *megacephala* group. The hypogæic and termitophilous ants are represented by species of *Diplomorium*, *Bondroitia*, *Solenopsis*, *Aëromyrma*, *Oligomyrmex*, *Carebara*, and *Pædalgus*. Africa is, however, very poor in species of *Solenopsis*, compared with South America, and *Meranoplus* has very few African species compared with the number found in Australia. The complex of closely allied genera comprising *Tetramorium*, *Rhoptromyrmex*, *Xiphomyrmex*, *Decamorium*, *Triglyphothrix*, and *Macromischoides* has many African species. This is particularly true of *Tetramorium*, which closely rivals *Crematogaster* and *Monomorium* in the number and variety of forms. In other portions of the globe, notably the Nearctic and Neotropical Regions, there are very few species of *Tetramorium* and *Xiphomyrmex*.

A negative peculiarity of considerable interest in connection with the subfamily Dolichoderinæ is the complete absence in Africa south of the Sahara of *Dolichoderus*, which is so well represented in the Indomalayan, Australian, and Neotropical, and even by a few species in the Palearctic and Nearctic Regions. On the other hand, Africa possesses one endemic genus, *Engramma*. A species of the genus *Semonius* (Map 2) which was supposed to be peculiar to Africa, has recently been described from the Indomalayan Region, and further research may show that this region also contains species of *Engramma*.



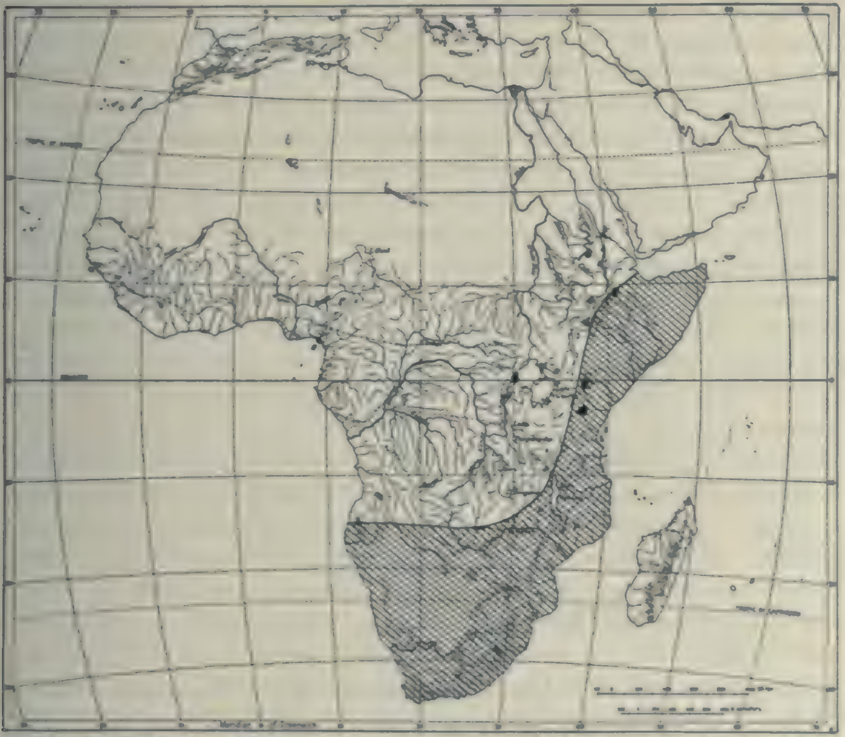
Map 2. Distribution of *Semonius* in Africa. This genus has recently been recorded from the Indomalayan Region (Singapore).

Three genera of Formicinæ, *Phasmomyrmex*, the very peculiar, large-eyed *Santschiella*, and *Aphomomyrmex*, which is very closely allied to *Myrmelachista* of the New World, are confined to the Ethiopian Region. Each, however, is represented by a single species. The characteristic complexion of the Ethiopian formicine fauna is due to the great develop-mend of the genera *Acantholepis* and *Plagiolepis*, with the subgenera *Anacantholepis* and *Anoplolepis*, the latter with several large and conspicuous species, and of the genera *Camponotus* and *Polyrhachis*. *Camponotus* is characterized by a few endemic subgenera (*Myrmopsamma*); some striking species of *Myrmopiromis*, *Myrmosericus*, and *Orthonotomyrmex;* an extraordinary development of the species, subspecies, and varieties of the subgenera *Myrmoturba* and *Myrmotrema*, especially of the *maculatus* and *foraminosus* complexes; and a surprisingly feeble development of other subgenera, such as *Colobopsis*, which has so many species in the Indomalayan and Papuan Regions. One species of *Orthonotomyrmex* (*sericeus*) and one of *Myrmosericus* (*rufoglaucus*) have a very wide distribution, ranging not only over the whole Ethiopian but occurring also in the Indomalayan Region. *Polyrhachis*, which is represented by numerous subgenera in the Indomalayan, Papuan, and Australian Regions, has species of only two subgenera, *Myrma* and *Cyrtomyrma*, in Africa. The genus is absent from Madagascar, but a species of the subgenus *Myrmhopla* (*simplex*) occurs as far north as Palestine, so that it would seem that the ancestors of the present Ethiopian species entered the continent by way of the Nile Valley and the Sudan. *Prenolepis* is poorly represented in Africa. The deserticolous genus *Cataglyphis* belongs properly to the Palearctic fauna and such species as are found in the Ethiopian Region must have come from the Sahara or Arabia. *Œcophylla* has a peculiar distribution, ranging clear across tropical Africa and through the Indomalayan and Papuan Regions into northern Queensland but not occurring in Madagascar.

Within the Ethiopian Region the distribution of species evidently depends on the distribution of temperature, moisture, and vegetation. It might be interesting to discuss this matter in detail but the data at present available are hardly sufficient. From the synonymic list, in which all the recorded localities for the various forms are cited, it will be seen that many species, subspecies, and varieties are known only from single stations. Some of the large, common, and conspicuous forms, however, such as *Megaponera fœtens*, *Paltothyreus tarsatus*, *Myrmicaria eumenoides*, etc., are known to occur throughout the Ethiopian Region. Others, e. g. *Pachysima æthiops*, *Viticicola tessmanni*, and several *Crematogasters*, are so intimately associated with certain host-plants as to be restricted to the range of the latter. Still others, such as the species of *Phrynoponera*, *Psalidomyrmex*, *Macromischoides*, and some species of *Polyrhachis* and *Camponotus*, are evidently confined to the rain forests of western equatorial Africa, while a considerable number of species of

Pheidole, *Crematogaster*, *Tetramorium*, *Monomorium*, etc., and the genera *Messor* and *Ocymyrmex* (Map 3) are peculiar to the dry savannahs.

The problem of the altitudinal distribution of the Formicidæ in the Ethiopian Region is peculiarly interesting in connection with the circumpolar fauna and the montane faunas in other parts of the World. As there is no general account of the subject, Dr. Bequaert, who collected on Mt. Ruwenzori, has written out for me the following sketch of what is known of the ant-faunas of this and the other high mountains of tropical Africa.



Map 3 Distribution of *Ocymyrmex*, a genus peculiar to the dry savannahs of East and South Africa.

"The ant-fauna becomes exceedingly poor in the higher alpine and subalpine regions of Central Africa and shows no peculiar forms nor any of the boreal, palearctic, or holarctic elements which are so conspicuous a feature of the flora.[1] Tropical plant and animal life stops at about the 1500 m. level-line; between 1500 and 2500 to 3000 m. extends a warm temperate belt, which may conveniently be called the lower mountain region. Its ant-fauna is scanty in species and individuals and includes only a few representatives of the more generally distributed Ethiopian genera. This is shown by the following list of genera of which workers were found by Alluaud and Jeannel on Mt. Kenia, the Aberdare Range, Mt. Kilimanjaro, and Mt. Ruwenzori, between 1500 and 2850 m.[1]: *Bothroponera* (1 sp.); *Dorylus, sens. str.* (2 sp.) and subgen. *Anomma* (1 sp.); *Monomorium* (3 sp.); *Messor* (2 sp.); *Pheidole* (5 sp.); *Oligomyrmex* (1 sp.); *Crematogaster* (3 sp.); *Xiphomyrmex* (1 sp.); *Engramma* (1 sp.); *Tapinoma* (1 sp.); *Technomyrmex* (1 sp.); *Plagiolepis* (1 sp.); *Acantholepis* (1 sp.); and *Camponotus* (6 sp.). The number of species represented is very small and most of them also occur at lower altitudes. The absence of certain common Ethiopian genera, such as *Paltothyreus, Megaponera, Euponera, Odontomachus, Ænictus, Tetraponera, Myrmicaria, Solenopsis, Cataulacus, Œcophylla*, and *Polyrhachis*, is very striking; furthermore, it must be noted that most of the montane ants mentioned above have been found below 2000 m. Indeed, on all Central African mountains reaching above 4000 m. there is between 2000 and 3000 m. a belt of very moist and cool forest, which for many hours of the day is often enveloped in clouds; it is well known that such an environment is very unfavorable to ants and accordingly a few species of *Crematogaster* and certain driver ants alone enter these cloud forests. On Mt. Kenia and Mt. Ruwenzori, the alpine region above the cloud forest up to the snowline (about 4500 m. in tropical Africa) is mainly covered with a peculiar swampy heath- and bog-formation, which practically excludes ant-life. Mt. Kilimanjaro, Mt. Meru, and the Aberdare Range, owing to their more eastern location, present, however, very different conditions: the usual cloud forest extends from 1800 to 2600 m. on the eastern and to 3000 m. on the western slopes; then begins a rather dry, alpine, steppe formation, with short grass growing in tussocks, where a few species of ants are found, nesting in the soil [*Melissotarsus emeryi* var. *pilipes* Santschi (Mt. Kilimanjaro, 2740 m.); *Tetramorium squaminode* Santschi (Mt. Kilimanjaro, 2600 to 3800 m.); *T. cæspitum* subsp. *altivagans* Santschi (Mt. Kinangop, 3100 m.); *Engramma ilgi* var. *stygium* Santschi (Mt. Kilimanjaro, 2740 m.); *Camponotus maculatus* subsp. *kersteni* (Gerstæcker), a strictly montane ant, known only from Mt. Kilimanjaro, where it is common between 2500 and 3000 m.]. Most of these ants, with the possible exception of the subspecies of *T.*

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[1] The fauna of these alpine and subalpine regions of tropical Africa possesses also a few boreal elements, e.g. among the Molluscs (*Helicidæ*, *Vitrinidæ*) and bees (*Andrena*, *Osmia*).

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[1] Genera which were collected in the winged sexual phases only are not included in this and similar lists because such individuals are apt to be carried to higher altitudes than their nesting sites.

cæspitum, are identical with or closely allied to Ethiopian forms of lower altitudes and evidently derived from them.

"Very few ants are known from Mt. Ruwenzori above 1500 m. and they were all collected on the eastern slopes (Uganda). Only the two following species have been recorded thus far: *Dorylus brevipennis* Emery, at Bujongolo (☿; Alluaud and Jeannel), and *D. nigricans* subsp. *burmeisteri* var. *molesta* (Gerstæcker), on the eastern slopes, 1600 m. (☿; Alluaud and Jeannel).[1] In April and May 1914 I collected altogether five species of ants in the cloud forest region of the western slopes of Mt. Ruwenzori, between 2000 and 2500 m.; unfortunately these specimens are not available for study. None was seen above 3000 m. The scarcity of ants in the Ruwenzori Range was very surprising; most striking among them were the columns of driver ants (*Dorylus nigricans*), often met with in the bamboo forests at about 2200 to 2500 m. Alluaud and Jeannel comment as follows upon the driver ants of the lower mountain region: 'In the forest of Kenia the *Anommas* are very abundant and we were even subjected to an invasion of our camp I, at 2400 m., in the lower forests; only fire and barriers of hot ashes succeeded in averting from the tents the columns of thousands of assailants. We have also frequently observed migrations of *Anomma* in the bamboo forest up to about 3000 m.' Sjöstedt observed driver ants on Mt. Meru, where they also reach 3000 m.

"It is rather unfortunate that no information is forthcoming regarding the ant-fauna of the alpine and subalpine regions of Mt. Cameroon, where ecological conditions are somewhat similar to those of Mt. Ruwenzori and Mt. Kilimanjaro."

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[1] *Dorylus nigricans* was also taken by the British Museum Ruwenzori Expedition on the eastern slopes, in the Mobuku Valley, between 5000 and 7000 feet

Table I

General Distribution of the Genera of Ants[1]

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Dorylus	+	.	+	+	.	S	.	.
Ænictogiton	+	.	.	.	.	.	.	.
Ænictus	+	.	+	+	+	S	.	.
Cheliomyrmex	.	.	.	.	.	.	.	+
Eciton	.	.	.	.	.	.	S	+
Leptanilla	.	.	+	.	.	S	.	.
Eusphinctus	.	.	+	+	+	.	.	.
Sphinctomyrmex	?	.	.	.	.	.	.	+
Cerapachys	+	+	+	+	+	S	S	+
Phyracaces	+	+	+	+	+	.	.	.
Lioponera	?	.	+	.	+	?S	.	.
Acanthostichus	.	.	.	.	.	.	S	+
Cylindromyrmex	.	.	.	.	.	.	.	+
Simopone	+	+	.	.	.	.	.	.
Myrmecia	.	.	.	.	+	.	.	.
Mystrium	+	+	+	.	.	.	.	.
Stigmatomma	.	.	+	+	+	S	+	+
Xymmer	+	.	.	.	.	.	.	.
Amblyopone	.	.	.	+	+	.	.	.
Myopopone	.	.	+	+	+	.	.	.
Paraponera	.	.	.	.	.	.	.	+
Platythyrea	+	+	+	+	+	.	S	+
Paranomopone	.	.	.	.	+	.	.	.
Prionopelta	.	.	+	+	.	.	.	+
Typhlomyrmex	.	.	.	.	.	.	.	+
Rhopalopone	.	.	+	+	.	.	.	+
Wheeleripone	.	.	.	+	.	.	.	.
Alfaria	.	.	.	.	.	.	.	+
Stictoponera	.	.	+	+	.	.	.	.
Acanthoponera	.	.	.	.	+	.	.	+
Holcoponera	.	.	.	.	.	.	.	+
Chalcoponera	.	.	+	+	+	.	.	.
Rhytidoponera	.	.	.	+	+	.	.	.
Emeryella	.	.	.	.	.	.	.	+
Ectatomma	.	.	.	.	.	.	S	+
Thaumatomyrmex	.	.	.	.	.	.	.	+

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[1] + = present; ? = generic reference doubtful; * = introduced genera; S = only in the southern part of the region.

Table I (continued)

General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Proceratium	.	.	+	+	.	.	+	.
Sysphincta	+	.	.	.	.	+	+	+
Discothyrea	+	.	+	+	+	.	+	.
Prodiscothyrea	.	.	+	.	+	.	.	.
Probolomyrmex	+		.	.	.	.	.	.
Escherichia	+	.	.	.	.	.	.	.
Spaniopone	.	.	.	.	.	.	.	+
Pseudosphincta	+	.	.	.	.	.	.	.
Dorylozelus	.	.	.	.	+	.	.	.
Centromyrmex	+	.	+	.	.	.	.	+
Harpegnathos	.	.	+	.	.	.	.	.
Odontoponera	.	.	+	+	.	.	.	.
Streblognathus	+	.	.	.	.	.	.	.
Paltothyreus	+	.	.	.	.	.	.	.
Glyphopone	+	.	.	.	.	.	.	.
Leptopone	+		.	.	.	.	.	.
Dinoponera	.		.	.	.	.	.	+
Diacamma	.	.	+	+	+	.	.	.
Megaponera	+	.	.	.	.	.	.	.
Ophthalmopone	+		.	.	.	.	.	.
Neoponera			.	.	.	.	.	+
Pachycondyla			.	.	.	.	8	+
Bothroponera	+	+	+	+	+	.	.	.
Phrynoponera	+		.	.	.	.	.	.
Ectomomyrmex	+		+	+	+	+	.	.
Euponera	+	+	+	+	+	+	.	+
Pseudoponera	+		+	.	.	.	.	.
Emeryopone			+	.	.	.	.	.
Belonopelta		.	.	.	.	.	.	+
Cryptopone	+	.	+	+	.	.	.	.
Ponera	+	+	+	+	+	+	+	+
Asphinctopone	+		.	.	.	.	.	.
Trapeziopelta			+	+	.	.	.	.
Plectroctena	+	.	.	.	.	.	.	.
Myopias	+	.	+	+	.	.	.	.
Psalidomyrmex	+	.		.	.	.	.	.
Cacopone	+	.	.	.	.	.	.	.
Onychomyrmex				.	+	.	.	.
Leptogenys	+	+	+	+	+	.	8	+

Table I (continued)

General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Prionogenys	.	.	.	.	+	.	.	.
Anochetus	+	+	+	+	+	S	.	+
Champsomyrmex	.	+	.	.	.	.	.	.
Odontomachus	+	+	+	+	+	.	S	+
Pseudomyrma	.	.	.	.	.	.	S	+
Tetraponera	+	+	+	+	+	S	.	.
Viticicola	+	.	.	.	.	.	.	.
Pachysima	+	.	.	.	.	.	.	.
Hylomyrma	.	.	.	.	.	.	.	+
Pogonomyrmex	.	.	.	.	.	.	+	+
Cratomyrmex	+	.	.	.	.	.	.	.
Myrmica	.	.	+	.	.	+	+	.
Stenamma	.	.	.	.	.	+	+	.
Sifolinia	.	.	.	.	.	+	.	.
Aphænogaster	.	+	+	+	+	+	+	+
Messor	+	.	.	.	.	+	.	.
Novomessor	.	.	.	.	.	.	S	+
Veromessor	.	.	.	.	.	.	S	+
Goniomma	.	.	.	.	.	S	.	.
Oxyopomyrmex	.	.	.	.	.	S	.	.
Machomyrma	.	.	.	.	+	.	.	.
Ischnomyrmex	.	.	+	.	.	.	.	.
Ceratopheidole	.	.	+	.	.	.	.	+
Parapheidole	.	+	.	.	.	.	.	.
Decapheidole	.	.	.	.	.	.	.	+
Pheidole	+	+	+	+	+	S	+	+
Epipheidole	.	.	.	.	.	.	+	.
Sympheidole	.	.	.	.	.	.	+	.
Melissotarsus	+	+	.	.	.	.	.	.
Rhopalomastix	.	.	+	.	.	.	.	.
Metapone	.	.	+	.	+	.	.	.
Stereomyrmex	.	.	+	.	.	.	.	.
Myrmicaria	+	.	+	+	.	.	.	.
Cardiocondyla	+	+	+	+	+	S	S	+
Crematogaster	+	+	+	+	+	S	+	+
Vollenhovia	.	+	+	+	.	.	.	.
Heteromyrmex	.	.	+	.	.	.	.	.
Huberia	.	.	.	.	+	.	.	.
Monomorium	+	+	+	+	+	S	S	+

Table I (continued)

General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Epixenus	.	.	.	.	.	S	.	.
Trichomyrmex	.	.	+	.	.	.	.	.
Hagioxenus	.	.	.	.	.	S	.	.
Wheeleriella	.	.	.	.	.	S	.	.
Phacota	.	.	.	.	.	S	.	.
Paraphacota	.	.	.	.	.	S	.	.
Xenomyrmex	.	.	.	.	.	.	.	+
Allomerus	.	.	.	.	.	.	.	+
Megalomyrmex	.	.	.	.	.	.	.	+
Liomyrmex	.	.	+	+	.	.	.	.
Epœcus	.	.	.	.	.	.	+	.
Anergates	.	.	.	.	.	+	.	.
Anergatides	+	.	.	.	.	.	.	.
Tranopelta	.	.	.	.	.	.	.	+
Carebarella	.	.	.	.	.	.	.	+
Diplomorium	+	.	.	.	.	.	.	.
Bondroitia	+	.	.	.	.	.	.	.
Solenopsis	+	+	+	+	+	+	+	+
Lophomyrmex	.	.	+	.	.	.	.	.
Trigonogaster	.	.	+	.	.	.	.	.
Pheidologeton	?	.	+	+	+	.	.	.
Aneleus	+	.	+	.	.	.	.	.
Aeromyrma	+	+	?	.	.	.	.	.
Oligomyrmex	+	+	+	+	+	S	.	.
Erebomyrma	.	.	.	.	.	.	S	+
Carebara	+	.	+	.	.	.	.	+
Pædalgus	+	.	+	.	.	.	.	.
Podomyrma	.	.	.	+	+	.	.	.
Lordomyrma	.	.	.	+	+	.	.	.
Atopomyrmex	+	.	.	.	.	.	.	.
Dilobocondyla	.	.	+	+	.	.	.	.
Terataner	+	+	.	.	.	.	.	.
Atopula	+	.	.	.	.	.	.	.
Paratopula	.	.	+	.	.	.	.	.
Brunella	.	+	.	.	.	.	.	.
Myrmecina	.	.	+	+	+	+	+	.
Pristomyrmex	.	.	+	+	+	S	.	.
Acanthomyrmex	.	.	+	+	.	.	.	.
Dacryon	.	.	.	+	+	.	.	.

Table I (continued)

General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Archæomyrmex	.	.	.	+	.		.	.
Mayriella	.	.	.	.	+	.	.	.
Promeranoplus	.	.	.	.	+	.	.	.
Meranoplus	+	+	+	+	+	.	.	.
Prodicroaspis	.	.	.	.	+	.	.	.
Calyptomyrmex	+	.	+	+	+	.	.	.
Macromischa	.	.	.	.	.	.	.	+
Macromischoides	+	.	.	.	.	.	.	.
Leptothorax	+	+	+	.	.	+	+	+
Harpagoxenus	.	.	.	.	.	+	+	.
Myrmoxenus	.	.	.	.	.	+	.	.
Formicoxenus	.	.	.	.	.	+	.	.
Epimyrma	.	.	.	.	.	S	.	.
Symmyrmica	.	.	.	.	.	.	+	.
Rogeria	.	.	.	+	.	.	.	+
Lachnomyrmex	.	.	.	.	.	.	.	+
Apsychomyrmex	.	.	.	.	.	.	.	+
Adelomyrmex	.	.	.	+	.	.	.	.
Ocymyrmex	+	.	.	.	.	.	.	.
Tetramyrma	+	.	.	.	.	.	.	
Lundella	.	.	.	.	.	.	.	+
Tetramorium	+	+	+	+	+	+	S	+
Rhoptromyrmex	+	.	.	.	.	.	.	
Acidomyrmex	.	.	+	.	.	.	.	
Strongylognathus	.	.	.	.	.	+	.	.
Xiphomyrmex	+	+	+	+	+	.	+	
Decamorium	+	.	.	.	.	.	.	.
Triglyphothrix	+	+	+	+	.	.	.	.
Eutetramorium	.	+	.	.	.	.	.	.
Ochetomyrmex	.	.	.	.	.	.	.	+
Wasmannia	.	.	.	.	.	.	.	+
Cataulacus	+	+	+	+	.	.	.	.
Procryptocerus	.	.	.	.	.	.	.	+
Zacryptocerus	.	.	.	.	.	.	.	+
Cephalotes	.	.	.	.	.	.	.	+
Cryptocerus	.	.	.	.	.	.	S	+
Basiceros	.	.	.	.	.	.	.	+
Daceton	.	.	.	.	.	.	.	+
Acanthognathus	.	.	.	.	.	.	.	+

Table I (continued)
General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Epitritus	+	.	.	+	+	S	.	+
Orectognathus	.	.	.	+	+	.	.	.
Pentastruma	.	.	+	.	.	.	.	.
Rhopalothrix	.	.	+	+	+	.	.	+
Microdaceton	+	.	.	.	.	.	.	.
Epopostruma	.	.	.	+	+	.	.	.
Glamyromyrmex	.	.	.	.	.	.	.	+
Codiomyrmex	.	.	.	.	.	.	.	+
Strumigenys	+	+	+	+	+	+	+	+
Stegomyrmex	.	.	.	.	.	.	.	+
Proatta		.	+	.	.	.	.	.
Pseudatta	.	.	.	.	.	.	.	+
Blepharidatta	.	.	.	.	.	.	.	+
Myrmicocrypta	.	.	.	.	.	.	.	+
Apterostigma	.	.	.	.	.	.	.	+
Mycocepurus	.	.	.	.	.	.	.	+
Cyphomyrmex	.	.	.	.	.	.	S	+
Sericomyrmex	.	.	.	.	.	.	.	+
Trachymyrmex	.	.	.	.	.	.	+	+
Atta	.	.	.	.	.	.	S	+
Aneuretus	.	.	+	.	.	.	.	.
Dolichoderus	.	.	+	+	+	+	+	+
Linepithema	.	.	.	.	.	.	.	+
Leptomyrmex	.	.	.	+	+	.	.	.
Semonius	+	.	+	.	.	.	.	.
Liometopum	.	.	.	.	.	S	+	
Turneria	.	.	.	+	+	.	.	.
Froggattella	.	.	.	.	+	.	.	.
Dorymyrmex	.	.	.	.	.	.	+	+
Araucomyrmex		.	.	.	.	.	.	+
Iridomyrmex	.	.	+	+	+	.	.	+
Bothriomyrmex	.	.	+	+	+	S	+	.
Forelius		.	.	.	.	.	S	+
Azteca	.	.	.	.	.	.		+
Engramma	+	.	.	.	.	.		.
Tapinoma	+	+	+	+	+	+	+	+
Technomyrmex	+	+	+	+	+	.		
Myrmoteras		.	+			.		
Dimorphomyrmex			+				.	

Table I (continued)
General Distribution of the Genera of Ants

	Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Santschiella	+	.	.	.	.	.	.	.
Notoncus	.	.	.	.	+	.	.	.
Myrmecorhynchus	.	.	.	.	+	.	.	.
Diodontolepis	.	.	.	.	+	.	.	.
Melophorus	.	.	.	.	+	.	.	.
Prolasius	.	.	.	.	+	.	.	.
Lasiophanes	.	.	.	.	.	.	.	+
Atopodon	.	.	+	.	.	.	.	.
Acropyga	+	.	+	+	+	.	.	.
Rhizomyrma	.	.	+	+	.	.	.	+
Pseudaphomomyrmex	.	.	+	.	.	.	.	.
Acantholepis	+	+	+	.	.	S	.	.
Stigmacros	.	.	.	.	+	.	.	.
Plagiolepis	+	+	+	+	+	S	.	.
Myrmelachista	.	.	.	.	.	.	.	+
Cladomyrma	.	.	+	.	.	.	.	.
Aphomomyrmex	+	.	.	.	.	.	.	.
Brachymyrmex	.	.	.	.	.	.	+	+
Gesomyrmex	.	.	+	.	.	.	.	.
Prenolepis	+	+	+	+	+	+	+	+
Pseudolasius	+	.	+	+	+	.	.	.
Lasius	.	.	.	.	.	+	+	.
Myrmecocystus	.	.	.	.	.	.	+	.
Cataglyphis	+	.	.	.	.	S	.	.
Polyergus	.	.	.	.	.	+	+	.
Formica	.	.	.	.	.	+	+	.
Gigantiops	.	.	.	.	.	.	.	+
Œcophylla	+	.	+	+	+	.	.	.
Opisthopsis	.	.	.	+	+	.	.	.
Notostigma	.	.	.	.	+	.	.	.
Camponotus	+	+	+	+	+	+	+	+
Phasmomyrmex	+	.	.	.	.	.	.	.
Overbeckia	.	.	+	.	.	.	.	.
Calomyrmex	.	.	+	+	+	.	.	.
Dendromyrmex	.	.	.	.	.	.	.	+
Echinopla	.	.	+	+	+	.	.	.
Mesoxena	.	.	.	+	.	.	.	.
Polyrhachis	+	.	+	+	+	S	.	.

Table II

Total Number of Genera and Number of Endemic Genera in each Region, also Number of Genera Common to other Regions[1]

Zoögeographical Regions	Total Number of Genera	Number of Endemic Genera	Genera Common to							
			Ethiopian	Malagasy	Indomalayan	Papuan	Australian	Palearctic	Nearctic	Neotropical
Ethiopian	90	34	..	34	48	39	34	28	19	22
Malagasy	40	4	34	..	32	29	26	20	18	19
Indomalayan	101	21	48	32	..	65	51	31	25	29
Papuan	81	4	39	29	65	..	59	28	23	27
Australian	81	18	34	26	51	59	..	27	22	24
Palearctic	54	13	28	20	31	28	27	..	26	20
Nearctic	53	5	19	18	25	23	22	26	..	36
Neotropical	97	48	22	19	29	27	24	20	36	..

Table III

Total Number of Genera and Number of Endemic Genera in Each of the Subfamilies

Zoögeographical Regions	Cerapachyinæ and Ponerinæ	Dorylinæ	Pseudomyrminæ and Myrmicinæ	Dolichoderinæ	Formicinæ	Totals
Ethiopian	33—15	3—1	38—14	4—1	12—3	90—34
Malagasy	12—1	0—0	22—3	2—0	4—0	40—4
Indomalayan	31—2	3—0	42—11	7—1	18—7	101—21
Papuan	27—1	2—0	33—2	7—0	12—1	81—4
Australian	26—5	1—0	29—5	8—1	17—7	81—18
Palearctic	7—0	3—0	31—13	4—0	9—0	54—13
Nearctic	12—0	1—0	27—4	6—0	7—1	53—5
Neotropical	28—12	2—1	51—28	8—3	8—4	97—48

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[1] Excluding introduced genera and the cases where the generic reference is doubtful.

Table IV

Number of Species, Subspecies, and Varieties Known from Each Region in 1911 (Forel)

Geographical Faunas		Species and Races or Subspecies	Varieties
I. Neotropical Fauna	a. South America, except Patagonia	961	208
	b. Central America	506	121
II. Ethiopian Fauna	(Africa south of the Sahara)	629	125
III. Malagasy Fauna	(Madagascar, Comoros, Chagos, Seychelles, etc.)	230	63
IV. Indomalayan Fauna	(India, Indo-China, Andamans, Ceylon, Indonesia, Philippines, part of China and Japan)	1165	210
V. Papuan and Oceanean Fauna	(Moluccas, New Guinea, Oceania)	335	42
VI. Australian Fauna	(Australia, New Caledonia, Tasmania)	380	105
VII. Palearctic Fauna	a. Palearctic proper	152	116
	b. Mediterranean (including North Africa, Sahara, Asia Minor, etc.)	294	158
VIII. Nearctic Fauna	(North America)	352	105
IX. Antarctic Fauna	(New Zealand, Patagonia)	27	3
Total		5031	1256

Table V

Number of Species, Subspecies, and Varieties of Each Genus Hitherto Recorded from the Ethiopian Region and the Belgian Congo

	ETHIOPIAN REGION			BELGIAN CONGO		
	Species	Subspecies	Varieties	Species	Subspecies	Varieties
Dorylus	41	20	42	26	8	10
Ænictogiton	5	. .	1	5	. .	1
Ænictus	25	6	7	5	1	1
? *Sphinctomyrmex*	1	1	. .	. .	. .	. .
Cerapachys	7	. .	3	1	. .	. .
Phyracaces	6	1	. .	3	1	. .
? *Lioponera*	2	. .	. .	. .	. .	. .
Simopone	2	. .	. .	. .	. .	. .
Mystrium	1	. .	. .	. .	. .	. .
Xymmer	1	. .	. .	. .	. .	. .
Platythyrea	14	2	5	4	. .	2
Sysphincta	1	. .	. .	. .	. .	. .
Discothyrea	3	. .	1	. .	. .	. .
Probolomyrmex	1	. .	. .	. .	. .	. .
Escherichia	1	. .	. .	. .	. .	. .
Pseudosphincta	1	. .	. .	. .	. .	. .
Centromyrmex	2	. .	2	. .	. .	. .
Streblognathus	1	. .	. .	. .	. .	. .
Paltothyreus	1	1	4	1	. .	. .
Glyphopone	1	. .	. .	1	. .	. .
Leptopone	1	. .	. .	. .	. .	. .
Megaponera	1	. .	1	1	. .	. .
Ophthalmopone	5	. .	. .	. .	. .	. .
Bothroponera	18	3	8	5	. .	3
Phrynoponera	5	. .	5	5	. .	5
Ectomomyrmex	1	. .	. .	. .	. .	. .
Euponera	17	2	5	4		1
Pseudoponera	2	. .	. .	. .	. .	. .
Cryptopone	1	. .	. .			. .
Ponera	17	8	5	3	1	. .
Asphinctopone	1	. .	. .	. .	. .	. .
Plectroctena	4	1	2	3	. .	. .
Myopias	1	1				
Psalidomyrmex	5	. .	. .	3	. .	. .
Cacopone	1	. .	. .	. .	. .	. .
Leptogenys	23	6	9	4	1	3
Anochetus	14	1	6	8	. .	1
Odontomachus	2	2	5	2	1	3
Tetraponera	21	9	9	5	1	3

Table V (continued)

Number of Species, Subspecies, and Varieties of Each Genus Hitherto Recorded from the Ethiopian Region and the Belgian Congo

	Ethiopian Region			Belgian Congo		
	Species	Subspecies	Varieties	Species	Subspecies	Varieties
Viticicola	1	..	1	1	..	1
Pachysima	2	..	..	2	..	..
Cratomyrmex	1	..	2	..	..	..
Messor	5	7	10	..	..	..
Pheidole	57	32	31	17	12	7
Melissotarsus	4	..	1	1	..	..
Myrmicaria	10	5	10	4	3	6
Cardiocondyla	1	1	..	1	..	..
Crematogaster	88	56	102	39	25	39
Monomorium	50	25	28	15	4	6
Diplomorium	1	..	..	..	..	..
Bondroitia	1	..	..	1	..	..
Solenopsis	8	4	4	2	2	..
Anergatides	1	..	..	1	..	..
? *Pheidologeton*	2	1	..	..	..	..
Aneleus	4	3	..	..	..	..
Oligomyrmex	6	1	1	1	1	..
Aëromyrma	9	..	1	1	..	..
Carebara	8	..	..	5	..	..
Pædalgus	2	..	..	1	..	..
Terataner	2	..	..	..	..	..
Atopomyrmex	1	1	2	1	1	2
Atopula	1	..	..	..	..	..
Calyptomyrmex	7	..	1	1	..	1
Meranoplus	7	5	2	2	1	..
Macromischoides	2	1	4	2	1	4
Leptothorax	6	2	..	3	..	..
Ocymyrmex	5	5	4	..	..	..
Tetramorium	50	29	43	10	6	7
Decamorium	1	..	1	..	..	..
Xiphomyrmex	11	2	5	5	1	..
Tetramyrma	1	..	..	..	..	..
Rhoptromyrmex	7	1	2	2	1	2
Triglyphothrix	18	1	6	2	..	1
**Wasmannia*	1	..	..	..	..	..
Cataulacus	25	15	16	10	2	5
Microdaceton	1	..	..	..	..	..
Strumigenys	20	5	3	3	1	2
Epitritus	2	..	..	..	..	..

Table V (continued)

Number of Species, Subspecies, and Varieties of Each Genus Hitherto Recorded from the Ethiopian Region and the Belgian Congo

	ETHIOPIAN REGION			BELGIAN CONGO		
	Species	Subspecies	Varieties	Species	Subspecies	Varieties
**Iridomyrmex*	1	..	..	..	..	..
Engramma	10	2	2	8	1	2
Tapinoma	10	3	4	1	1	..
Technomyrmex	9	2	4	6	..	1
Semonius	1	..	..	..	..	..
Santschiella	1	..	..	1	..	..
Acropyga	1	..	..	..	..	..
Plagiolepis	26	3	8	6	1	1
Acantholepis	20	11	16	5	2	4
Aphomomyrmex	2	..	..	..	..	..
Prenolepis	13	..	1	5	..	..
Pseudolasius	4	..	1	3	..	1
Cataglyphis	2	4	2	..	..	..
Œcophylla	2	..	4	1	..	3
Camponotus	94	81	76	37	33	19
Phasmomyrmex	1	..	..	1	..	..
Polyrhachis	37	17	22	23	9	11
TOTAL	920	389	540	318	122	158

THE PECULIARITIES OF THE MALAGASY ANT-FAUNA

The Malagasy Region includes Madagascar and a number of small neighboring islands known as the Comoros, Seychelles, and Chagos. The ant-fauna of Madagascar was first studied by Forel in a splendid volume in Grandidier's large work on the physical and political history of the island. More recently, the Swiss myrmecologist has contributed data on the ants of the smaller islands. Turning again to Tables I, II, and III, we note the following facts.

1.—The Malagasy ant-fauna comprises 40 genera, somewhat less than half the number known from the Ethiopian Region, but only four of these (*Champsomyrmex*, *Parapheidole*, *Brunella*, and *Eutetramorium*) are endemic, or precinctive.

2.—Of the 40 genera, 34 are common to the Ethiopian and 32 to the Indomalayan, so that the affinities appear to be about equally divided between these two regions.

3.—The generic affinities with the Papuan and Australian Regions are somewhat less pronounced (29 and 26 respectively), but considerably more than with the Palearctic, Nearctic, and Neotropical (20, 18, and 19 respectively).

4.—The subfamily Dorylinæ is completely absent from the Malagasy Region.

5.—The Dolichoderinæ are poorly represented by two genera.

6.—The Formicinæ are represented by only four genera (*Acantholepis*, *Plagiolepis*, *Prenolepis*, and *Camponotus*).

7.—The Malagasy possesses only two genera (*Aphænogaster* and *Vollenhovia*) which are not known to occur in the Ethiopian Region.

8.—On the other hand, there are 13 genera (*Discothyrea*, *Centromyrmex*, *Ectomomyrmex*, *Dorylus*, *Ænictus*, *Myrmicaria*, *Carebara*, *Pædalgus*, *Calyptomyrmex*, *Semonius*, *Pseudolasius*, *Œcophylla*, and *Polyrhachis*) which occur in the Indomalayan and Ethiopian Regions but are not known to occur in the Malagasy.

9.—Three peculiar genera (*Simopone*, *Melissotarsus*, and *Terataner*) are known to occur only in the Ethiopian and Malagasy Regions.

The following remarks on particular genera are of general interest. Of the four endemic, or precinctive, genera, *Champsomyrmex*, *Parapheidole*, and *Brunella* are monotypic and *Eutetramorium* contains only two species. *Champsomyrmex* is very close to *Odontomachus; Parapheidole* seems to be very close to and parasitic on *Pheidole;* the species of *Brunella* was originally described as an *Aphænogaster*, and *Eutetramorium*, as the name indicates, is allied to *Tetramorium*. These four genera, therefore, lend nothing very striking to the complexion of the Malagasy ant-fauna. Its distinctive features are due to the peculiar development of species within certain genera which it shares with the faunas of other regions.

Among the Ponerinæ, the very ancient and primitive genera *Simopone* with 3 and *Mystrium* with 5 species show a greater development than elsewhere, though the former occurs also in Africa and the latter both in Africa and the Indomalayan Region. The only known species of *Euponera*, *sensu stricto*, (*E. sikoræ* Forel) is found in Madagascar. *Leptogenys* is beautifully represented by no less than 16 species, including three species of an endemic subgenus, *Machærogenys*. The remaining genera of the subfamily show nothing unusual.

Among the Myrmicinæ, we find *Tetraponera* represented by 12 species and *Aphænogaster*, which does not occur in the Ethiopian Region, by 2, one of *Aphænogaster*, *sensu stricto*, and one of the subgenus

Deromyrma. *Crematogaster* has 21 species, distributed among the following subgenera: *Crematogaster, sensu stricto*, 11; *Orthocrema*, 1; *Oxygyne*, 5; *Decacrema*, 4. One of the species of *Vollenhovia* (*lævithorax* Emery) and the single species of *Triglyphothrix*, *T. striatidens* (Emery), are really tropical "tramps" from the Indomalayan Region. *Pheidole* is well represented by 17 species, some of which have a peculiar habitus. The *megacephala* group comprises a number of forms as in the Ethiopian Region. *Terataner* with 5, *Xiphomyrmex* with 13, and *Cataulacus* with 8 species are unusually well represented, considering the small size of the territory.

The Dolichoderinæ, as previously stated, have a very poor representation, *Tapinoma* by only one species, *melanocephalum* (Fabricius), a common tropicopolitan tramp, and *Technomyrmex* by 4 species, 3 of which are confined to Madagascar, while one, *albipes* (Smith), is widely distributed over the Indomalayan and Papuan Regions.

The greatest representation of Formicinæ is furnished by the genera *Prenolepis* with 11 and *Camponotus* with 47 species. The latter genus is remarkable on account of the great number of subgenera represented (*Camponotus, sensu stricto*, with 1; *Myrmoturba* with 4; *Dinomyrmex* with 5; *Myrmosaga* with 7; *Myrmosericus* with 1; *Mayria* with 1; *Myrmotrema* with 2; *Colobopsis* with 1; *Myrmonesites* with 6; *Myrmopytia* with 1; *Myrmorhachis* with 1; *Orthonotomyrmex* with 15; *Myrmosaulus* with 1; and *Myrmopiromis* with 7 species). The subgenera *Mayria*, *Myrmosaga*, *Myrmonesites*, and *Myrmopytia* are confined to Madagascar. The single species of *Brachymyrmex*, *B. cordemoyi* (Forel), known to occur in the island of Réunion, has been introduced by commerce from South America. In Table VI the Malagasy genera of ants are listed, with the number of known species, subspecies, and varieties. According to Forel,[1] the fauna is made up of groups of species having the following provenience and affinities.

A.—Imported Forms

1.	Tropicopolitan forms, imported on various occasions by ships	8
2.	American forms, evidently of recent importation: *Brachymyrmex cordemoyi* (Forel), *Pheidole flavens* Roger	2
3.	Of recent importation from Indomalaya: *Plagiolepis longipes* (Jerdon)	1
4.	Derived from Oceania: *Strumigenys godeffroyi* Mayr.	1
5.	More or less ancient Indomalayan importations.	6
6.	More or less ancient African importations.	9
	Total	27

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[1] 1907, 'La faune malgache des fourmis et ses rapports avec les faunes de l'Afrique, de l'Inde, de l'Australie, etc.' Rev. Suisse Zool., XV, pp. 1-6.

B.—Malagasy Forms

7.	With cosmopolitan affinities (varieties of intercontinental species)	9
8.	With Indomalayan affinities	10
9.	With Ethiopian affinities	9
10.	With very distinct Australasiatic (Moluccan and Australian) affinities. To these many might be added from the following group which, on the whole, have Moluccan and Australian affinities	9
11.	Malagasy forms proper	201
	Total	238

Forel summarizes his views on the Malagasy ant-fauna as follows:

> To sum up, the local Malagasy fauna is a fauna of extremely ancient relicts, which have been evolved in certain intercontinental groups (*Camponotus*, *Pheidole*, *Crematogaster*, etc.) to form a very peculiar fauna, the most ancient and primordial affinities of which connect it with the ancient fauna of the Moluccas and Northern Australia. But whereas the Indomalayan genus *Polyrhachis* has invaded Australasia and Australia, it no more exists in Madagascar than does the subfamily Dorylinæ. Subsequently, invasions from East Africa and India confused the situation; still analysis is possible, although it is sometimes difficult to distinguish the direction of the invasions, especially that of the Malagasy fauna into Africa and India.
>
> Finally, very recent invasions of cosmopolitan and even of American species, introduced, without doubt, by shipping, have still further complicated the situation, especially in the small Malagasy archipelagos and along the coast. Nevertheless, it is on the whole easy in these cases to detect the invasions and to avoid erroneous interpretations. The genus *Brachymyrmex* admits of no doubt, and an eye-witness, M. Vinson, of St. Denys, was able to give me exact information, through M. de Cordemoy, on the invasion of *Plagiolepis longipes* into Réunion some twenty-five years ago.

Table VI

Number of Species, Subspecies, and Varieties of Each Genus Hitherto Recorded from the Malagasy Region

	Number of Species	Number of Subspecies	Number of Varieties
Cerapachys	1	..	..
Phyracaces	2	..	1
Simopone	3	..	..
Mystrium	5	..	1
Platythyrea	4	1	1
Bothroponera	4	1	..
Euponera	4	..	2
Ponera	6	3	2
Leptogenys	16	2	2
Anochetus	2	..	2
Champsomyrmex	1	1	..
Odontomachus	1	..	..
Tetraponera	12	4	4
Aphænogaster	3	..	3
Parapheidole	1	..	..
Pheidole	17	3	8
Melissotarsus	1	..	..
Cardiocondyla	4	1	2
Crematogaster	21	7	6
Vollenhovia	2	1	..
Monomorium	8	5	..
Solenopsis	1	..	..
Aeromyrma	1	..	..
Oligomyrmex	2	..	..
Terataner	5	..	..
Brunella	1	..	..
Meranoplus	2	..	..
Leptothorax	3	..	..
Tetramorium	5	2	1
Xiphomyrmex	13	2	1
Triglyphothrix	1	..	1
Eutetramorium	2	..	
Cataulacus	8	..	
Strumigenys	4	..	
Tapinoma	2	..	
Technomyrmex	4	2	1
Acantholepis	1		
Plagiolepis	5	1	
**Brachymyrmex*	1	..	
Prenolepis	11	4	3
Camponotus	47	16	29
	—	—	—
Total	237	56	70

II. THE ANTS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION

By Wm. M. Wheeler

Dorylinæ

Worker and Soldier.—Clypeus as a rule very short and not limited by sutures. Frontal carinæ vertical, not covering the insertions of the antennæ. Antennæ inserted near the mouth and close to each other, often less than 12-jointed. Palpi at most 3-jointed, in *Leptanilla* only one-jointed. Ocelli and eyes often absent (without exception in all African genera). Sutures of the thorax more or less vestigial; mesonotum touching the epinotum on the dorsal face, without interposed metanotum. Spurs of the tibiæ pectinate or rudimentary. Postpetiole not always separated by a constriction from the third segment; however, in *Eciton*, *Ænictus*, and *Leptanilla*, narrowed into the second joint of a two-jointed pedicel. Sting developed.

Female.—Permanently apterous, with the abdomen much enlarged and swollen; very different morphologically from the worker. Clypeus as in the worker. Frontal carinæ more or less separated. Antennæ 10- to 12-jointed. No ocelli; eyes not more developed than in the worker; female blind when the worker is so. Segmentation of the thorax more or less rudimentary; no traces of wings or a rudiment left at the tegulæ (*Dorylus*). Postpetiole never separated from the third segment, the pedicel always composed of one segment. Gaster long and voluminous.

Male.—Clypeus and frontal carinæ much as in the female. Mandibles developed, as a rule large; in *Leptanilla* very short. Antennæ 13-jointed; scape long, in *Leptanilla* only slightly longer than the second joint. Eyes and ocelli well developed. Thorax with normal segmentation, winged. Postpetiole and pedicel much as in the female. Genitalia completely retractile (Dorylini and Ecitini) or exserted and not retractile (Leptanillini); subgenital lamina split or furcate; cerci absent.

Larvæ more or less cylindrical, with short hairs, without hooked setæ; mandibles small, slender, falcate.

Nymphs usually naked; enclosed in a cocoon in some species of *Eciton*.

The three castes in this subfamily are so different from one another that their true relations remained for a very long time unsettled. The winged males were the first to be known and were originally placed with the Mutillidæ. The workers and females were recognized as ants but at first classified in genera by themselves. Though their relations were more or less suspected by Lepeletier de Saint-Fargeau, Haliday, and Shuckard, the true affinities of the male and worker became only gradually known after 1850, when Savage observed for the first time in West Africa *Dorylus* males walking in an army of *Anomma* workers. The females, leading a permanently subterranean life, are still excessively rare in collections and known only for a few species; their capture in the smaller species is rather fortuitous, whereas in such fierce army ants as *Anomma* it is a very troublesome operation.

G. Arnold[1] gives the following general account of the habits of this subfamily:

> The members of this subfamily are commonly known as driver or legionary ants. The males, which are winged and provided with eyes, are frequently taken at lights; on the other hand, the workers are blind, with the exception of some species of *Eciton*, in which there is a pair of single-faceted eyes, and the females (excepting one species of *Eciton*) are both blind and wingless. The members of the genus *Dorylus* are almost entirely subterranean in their mode of life, rarely coming to the surface except in dull, cloudy weather. The species of the subgenus *Anomma*, which live in the more tropical and forested regions of Africa, and to which the term driver ants was originally applied, and the Ecitini of South America, are, however, usually seen above the surface, although, should the rays of the sun prove too powerful, they will construct temporarily tunnels with particles of earth held together by their saliva. The species of *Ænictus* are not so shy of the light and may be seen foraging about even in bright sunlight. It is probable that all, or at least the majority of the species are carnivorous, although *D. orientalis* has been shown by Green to feed also on tubers and the bark of trees.
>
> As far as known the members of this subfamily do not as a rule make permanent nests. This course is determined by their exceedingly predatory habits, which compel the adoption of a migratory form of life together with the formation of temporary nests in localities which are sufficiently productive of animal life to detain them for any length of time. Ranging far and wide in search of prey, which consists of any animal they are strong enough to overpower, these ants must sooner or later exhaust the areas round their nests, and are forced to remove the latter to new and more productive hunting grounds.

But little is known of the habits of the Leptanillini; all species are hypogæic. Santschi found the nest of *Leptanilla nana* Santschi 40 cm. beneath the surface in clay soil; he caught females and workers by inundating the soil so as to force them to come out of their burrows; workers have also been taken by sifting decayed leaves. The males are attracted by lights.

A detailed account of the migrations and habits of some of the African species is given below (see under *Dorylus bequaerti*, *D. opacus*, *D. kohli*, *D. nigricans*, *D. wilverthi*, and *D. fulvus*).

The Dorylinæ are abundantly found in all tropical parts of the world, with the exception of the Antilles and the Malagasy Region; they are absent from the larger part of Australia. A few species reach North Africa, the coasts of Asia Minor, and the central and southern United States.

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[1] 1915, Ann. South African Mus., XIV, p. 110.

DORYLUS Fabricius

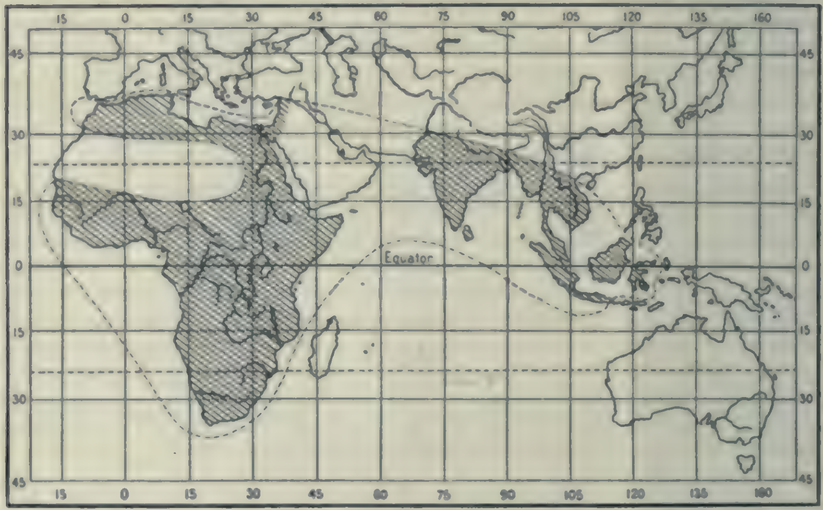
WORKERS small or of medium size, without eyes or ocelli, highly polymorphic, constituting a series of forms which may be grouped as maximæ, or soldiers, mediæ and minimæ. In the maxima the head is very large and usually broader in front than behind, the mandibles are long and narrow, with a small number of teeth on the inner border, the clypeus is very short and not marked off from the remainder of the head by sutures. Frontal carinæ very short, erect, close together, not concealing the insertions of the antennæ. Antennæ short, inserted very near the mouth, 9- to 12-jointed, according to the species. Mediæ smaller, with much smaller and shorter head, but the latter not narrowed in front; anterior border of clypeus more or less projecting in the middle over the mouth. Antennæ as in the maxima. Minima very small, with the head narrowed anteriorly and the anterior border of the clypeus strongly projecting in the middle. Number of antennal joints reduced, seven being the minimum. Promesonotal suture distinct in all three forms of worker; meso-ēpinotal suture obsolete. Epinotum always unarmed. Petiole nodiform; postpetiole narrowed anteriorly, not or only indistinctly separated from the first gastric segment. Pygidium with a dorsal impression and terminating in three points. Posterior tibiæ each with a pectinated spur.

FEMALE very much larger than the worker, dichthadiiform, i. e. wingless, with long and voluminous abdomen. The head has the occipital lobes swollen and rounded, separated by a median longitudinal furrow. Eyes and ocelli absent, as in the workers. Clypeus as in the worker maxima, or soldier. Mandibles narrow, edentate. Antennæ 11-jointed (12-jointed in the subgenus *Dichthadia*). Thorax segmented, but the mesonotum without differentiated scutum and scutellum; alar insertions vestigial. Petiole large, its posterior corners prolonged as blunt points. Postpetiole shorter than the first gastric segment, but not followed by a constriction. Pygidium and hypopygium gaping or separated so as to expose to view the eighth pair of abdominal spiracles, the anal segment and sting; the pygidium not impressed; the hypopygium surpassing the pygidium considerably and terminating in two lobes or appendages.

MALE very large, with very large eyes and ocelli. Clypeus short, prolonged backward between the short, diverging frontal carinæ. Mandibles edentate. Antennæ 13-jointed; scape one-third or one-fourth as long as the funiculus which is filiform. Legs short; femora flattened, tibiæ narrow. Wings with narrow, poorly defined pterostigma, placed near the apical third; radial cell elongate and open; one closed cubital cell, usually one recurrent nervure (two in the subgenus *Rhogmus* and in some anomalies). Petiole nodiform or saucer-shaped, its concavity turned toward the postpetiole, the latter not separated from the gaster by a constriction. Gaster long, cylindrical or club-shaped. Pygidium rounded or split at the posterior border (*Rhogmus fimbriatus*). Genital armature voluminous, completely retractile; annular lamina narrow; stipes and volsella simple; lacinia absent; subgenital plate deeply furcate.

Emery, who has devoted much careful study to the Dorylinæ, divides *Dorylus* into six subgenera (*Dorylus, sensu stricto; Dichthadia* Gerstæcker; *Anomma* Shuckard; *Typhlopone* Westwood; *Rhogmus* Shuckard; *Alaopone* Emery) mainly on the number of antennal joints and structure of the pygidium in the worker, the number of antennal joints and shape of the hypopygium in the female, and the shape of the mandibles and petiole in the male. The genus (Map 4) occurs throughout Africa, India, Indochina, the Malayan Region, and Indonesia (Borneo, Java, Sumatra, and Celebes). All but one of the subgenera and most of the species are found in Africa; in Asia there are less than half a dozen species belonging to the subgenera *Dichthadia*, *Typhlopone*, and *Alaopone*.

In the 'Genera Insectorum' (Dorylinæ, 1910, p. 7) Emery makes the following statement on the ethology of the genus *Dorylus*:



Map 4. Distribution of the genus *Dorylus*.

> Apart from the subgenus *Anomma* all the species of *Dorylus* lead a subterranean life and come to the surface of the soil only on exceptional occasions, as, *e. g.*, during inundations or in order to accompany the males when they take flight. Their societies are very populous. The soldiers and workers make subterranean expeditions for the purpose of capturing insects and other small animals, and exploit manure piles, cadavers and probably also the nests of termites. The males come to lights at night. Search for the heavy and voluminous apterous females is beset with difficulties so that they are rare in collections. It may be noted that in all the specimens hitherto described, with the exception of the female of *D. fimbriatus* described by Brauns, the terminal tarsal joints are lacking. I infer that the workers tear them off during the underground forays, while they are dragging the colossal queen by all her legs through the narrow galleries.

Dorylus atratus F. Smith

A single male from Stanleyville (Lang and Chapin).

Dorylus brevipennis Emery variety **marshalli** Emery

A single male from Medje (Lang and Chapin).

Dorylus bequaerti Forel

I refer to this species, originally taken by Dr. Bequaert at Sankisia in the Katanga, numerous workers from two colonies, one taken by Mr. Lang at Banana, the other by Dr. Bequaert at Pasaconde near Zambi "in galleries under ground and in a fallen trunk of *Hyphæne*." The largest workers of the former colony are only 4 mm. long and therefore somewhat smaller than those seen by Forel (5 mm.) and the color is paler. They are probably not the largest workers of the colony. The largest individuals taken by Dr. Bequaert are fully 5 mm. long and darker in color. The head is deeply and broadly excavated behind and has straight, subparallel sides; the first funicular joint is distinctly longer than broad, the remaining joints, except the last, broader than long, and the petiole is also slightly broader than long. The whole body is evenly and sharply punctate, the punctures on the gaster somewhat smaller but very distinct. The large workers are rich ferruginous red, with somewhat paler gaster; the smaller workers are decidedly paler, like those taken by Mr. Lang at Banana.

Dorylus depilis (Emery)

Faradje, ♂; Medje, ♂; Stanleyville, ♂ (Lang and Chapin). Seven specimens, all belonging to the typical form of this well-known species.

Dorylus mœstus (Emery)

A single male from Stanleyville (Lang and Chapin).

Dorylus staudingeri Emery

A single male from Medje (Lang and Chapin).

Dorylus (**Anomma**) **emeryi** Mayr subspecies **opacus** Forel

A fine series of workers of all sizes from a single colony taken at Ngayu (Lang and Chapin). "They appeared during the night, apparently attracted by some bones of large mammals, which they completely covered." The sides of the head of the largest workers are less convex than indicated by Santschi's figure and like that which he gives of *D.*

emeryi, though slightly narrower and much more deeply excavated behind. The preapical tooth of the mandibles is lacking in the largest, though present in the mediæ and smallest workers. There are also three workers from Medje, taken from the stomach of a toad (*Bufo funereus*).

Dorylus (Anomma) funereus Emery

Medje, ♂; Stanleyville, ♂; Bolobo to Lukolela, ♂ (Lang and Chapin). Single specimens from each of these localities agree closely with Emery's description of the types from the Gold Coast.

Dorylus (Anomma) kohli Wasmann

Twenty workers from Akenge and Niangara, taken from the stomachs of toads (*Bufo funereus*) and frogs (*Kassina senegalensis* and *Hemisus marmoratum*), and a fine series of workers of all sizes from Avakubi (Lang and Chapin) with the following note: "They usually appear in great masses, coming right out of the ground, underneath a piece of meat. Even palm oil, poured on the floor, will attract them in the same way." This observation shows that the species is hypogæic like the species of *Dorylus, sensu stricto*, and not epigæic like *Dorylus (Anomma) nigricans* and its various subspecies and varieties, and agrees with the observations of Father Kohl, quoted by Wasmann: "This species seems to be intermediate between the subterranean *Dorylus, sensu stricto*, and the driver ants. Its discoverer, Father Kohl, who found it at St. Gabriel near Stanleyville on the Upper Congo, writes as follows: 'The ants just mentioned seem always to wander about beneath the surface of the ground; at any rate, I have seen them on the surface only on three occasions and always after a rain.'" Wasmann adds the interesting statement: "The subterranean mode of life of *D. kohli* may also be inferred from its guests, which are much less like those of *Anomma* than of *Dorylus helvolus* L. The development of the eyes of *Pygostenus pusillus* Wasm., which lives with *D. kohli*, is about half way between the small eyes of *P. raffrayi* Wasm., a guest of *D. helvolus* L., and the very large eyes of the *Pygostenus* species which live with *Anomma wilwerthi* Emery. Here, too, there is a hint in regard to the habits of the host." The remarkable wingless phorid *Hexacantherophora cohabitans*, recently described by H. Schmitz,[1] was also found with *Dorylus kohli* by Father Kohl at St. Gabriel near Stanleyville.

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[1] 1914, Zool. Jahrb. Abt. Syst., XXXVII, pp. 512–515, Pl. xxix, fig. 1.

Dorylus (Anomma) kohli variety **congolensis** Santschi

Two series of workers, one taken at Leopoldville by Mr. Lang, the other at Thysville by Dr. Bequaert, evidently belong to this variety, in which the head of workers measuring 7 mm. is as broad as long, whereas in the typical *kohli* it is longer than broad in individuals of the same size, with somewhat less pointed posterior angles.

The Leopoldville specimens were found "under a piece of tin on the shore of Stanley Pool," those from Thysville were "marching in a subterranean burrow in a forest gallery."

Dorylus (Anomma) kohli variety **langi,** new variety

A series of more than a hundred workers from Malela (Lang and Chapin), taken beneath the prostrate trunk of a palm, represent a new variety near variety *frenisyi* Forel and variety *minor* Santschi. They range in size from 3 to 8 mm. The largest are very probably the true maxima workers as they lack the preapical mandibular tooth. In *frenisyi* the largest workers attain a length of 8.5 mm., in *minor* 8 mm.

The head of *langi* is nearly as broad as long, its sides convex and distinctly converging behind so that the occipital border, which is deeply and rather angularly excised, is about three-fourths as long as the anterior. The dorsal and ventral surfaces of the head are somewhat flattened. The whole body is finely, sharply, and rather uniformly shagreened or minutely and densely punctate and subopaque; the mandibles smooth and shining; the gaster behind its first segment feebly shining. The upper surface of the head, thorax, and gaster are uniformly but sparsely punctate, the punctures nonpiligerous for the most part. The suberect, yellow hairs are very sparse and confined to the gaster and the same is true of the dilute appressed pubescence. Legs and scapes with short stiff and appressed hairs, absent or very sparse on the extensor surfaces of the femora and tibiæ. In some specimens a few very fine short hairs can be detected, under a magnification of 20 diameters, arising from the coarse punctures on the vertex or posterior corners of the head. Color rather bright reddish ferruginous, with the legs paler and the mandibles and the upper surface of the head, except the cheeks and occiput, dark brown or blackish. The upper surface of the thorax and gaster, except the posterior borders of the segments of the latter, are darker and more brownish than the pleuræ and venter. The petiole is scarcely longer than broad, its ventral tooth small, compressed and directed backward. The smaller workers have the head of nearly the same shape and proportions as the larger but less deeply excised behind and more shining, as is also the body. The pubescence is also a little more abundant. The color is very similar but paler in the smallest individuals.

Dorylus (Anomma) kohli variety **chapini,** new variety

This is a very distinct form, represented by a series of two dozen workers from Stanleyville (Lang and Chapin), without further data. They measure 1.5 to 6 mm. in length. The largest specimens are probably not the maxima forms as they have a preapical mandibular tooth.

The body is only slightly shining and very similar in sculpture to the preceding variety except that the punctures are coarser, sharper and piligerous. They are evenly distributed over the dorsal surface of the head and pronotum, similar but smaller and shallower on the epinotum and gaster, and very indistinct or absent on the petiole. Mandibles and legs smooth and shining. The head, pro- and mesonotum, gaster, scapes, and legs are covered with short, subappressed, yellow hairs arising from the punctures and forming a conspicuous, rather abundant, coarse pubescence. The body is brownish ferruginous, the head slightly darker, and appendages paler, the mandibles blackish. The head is scarcely longer than broad in front, the sides very feebly convex and converging to the posterior border, which is only slightly excised and about four-fifths as long as the anterior border. The petiole is as broad as long. The smaller workers closely resemble the larger, except that the head is a little longer and the color paler.

Dorylus (**Anomma**) **nigricans** Illiger subspecies **arcens** (Westwood)

Eleven maxima and media workers from Medje (Lang and Chapin), taken from the stomach of a toad (*Bufo funereus*), are very dark, almost black, and are evidently referable to this subspecies, though the largest specimens are only about 10.5 mm. long, whereas the largest workers, according to Emery and Santschi, measure 13 mm. The surface of the body is very shining, the head more opaque in front.

Dorylus (**Anomma**) **nigricans** subspecies **burmeisteri** (Shuckard)

Seven workers from the stomach of a toad (*Bufo regularis*) taken at Stanleyville; a series of workers of all sizes from Stanleyville and Lukolela to Basoko (Lang and Chapin); also workers from Katala (J. Bequaert).

Dorylus nigricans is the famous driver or army ant, which has so greatly impressed all the African explorers. In my ant-book I have quoted some of the accounts of the earlier observers. To the field naturalist the various races of *D. nigricans* and *D. wilverthi* are so similar in appearance and habits that he designates them all as "driver" or "army" ants. It is not surprising therefore that Mr. Lang's notes refer indifferently to both species. The four fine photographs (Pls. II, III, and IV) belong undoubtedly to *D. wilverthi* (*vide infra*) but the following note probably refers to both species: "Wherever they go, even though the file be very small, the army ants clear a road that can be easily seen. But when a large army is passing, they not only build a road but also bridges and frequently even fill in all the depressions between the dried grass with particles of sand or soil until a perfect road has been constructed. Across a pathway used by pedestrians, where they are often disturbed, they build walls and regular tunnels even in the hardest ground. Particle by particle is carried out by the steady stream of small workers and the soldiers, large and small, watch on both sides of the line, ever ready to attack anything that may approach. They assume a very peculiar attitude, with mandibles wide open and the head and thorax bent up and back till it forms a right angle with the abdomen. When they seize anything, the abdomen can be torn off without their loosening their grip. They are greatly feared by the natives and even the greatest laggard moves rapidly when passing 'the line.'"

In connection with the fact cited by the early explorers, that the drivers are able to kill large animals when confinement prevents their escape, Santschi's quotation of the following observation of Cruchet concerning *D. nigricans* in Benguela is of interest: "Twice during the course of the year we have been compelled to take the cows out of the kraal and drive them elsewhere, because they bellowed so piteously. On looking into the matter we found that the Anommas caused all this disturbance by crawling into the natural orifices of the animals, especially the anus and vulva. A brooding hen had her head half eaten away, but would not abandon her eggs. On three occasions one of my comrads had to quit his chamber during the night and take up his quarters in the work shop."

According to Forel,[1] a very interesting account of the habits of *Dorylus nigricans* in East Africa has been published by Vosseler,[2] but I have not had access to this paper. Forel's paper, however, contains reproductions of three of Vosseler's photographs, one showing the *Anomma* overwhelming a white rabbit and the others showing its army on the march and crossing a stream. Prof. Emery, some years ago, kindly sent me copies of these photographs, which seem to me worthy of being again reproduced for the benefit of my American readers (Pl. V, figs. 1 and 2; Pl. VI, fig. 1).

The singular dichthadiigyne, or female of *D. nigricans*, was discovered by H. Schultze in Uganda. It measures 29 to 31 mm. and has been carefully figured and described by Forel in the work cited above (p. 177).

Dorylus (Anomma) nigricans subspecies **burmeisteri** variety **rubellus** (Savage)

Several workers from Boma (Lang and Chapin).

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[1] 1912. Mitt. Naturh. Mus. Hamburg, XXIX, p. 174, footnote.

[2] Pflanzer, Nov. 4, 1905, pp. 289-302.

Dorylus (Anomma) nigricans subspecies **sjœstedti** Emery

Three large workers from Faradje, Niangara, and Medje, taken from the stomachs of toads (*Bufo regularis* and *B. superciliaris*) and a frog (*Rana occipitalis*); also a large series of workers from Faradje (Lang and Chapin).

This form closely resembles subspecies *burmeisteri* variety *molestus* (Gerstæcker) in having the inferoposterior angles of the petiole prolonged outward as distinct tubercles, but is readily distinguished by having the head of the larger workers (7 to 12.5 mm.) opaque instead of shining and that of the smaller workers elongate.

An interesting account of the habits of *rubellus* and *sjœstedti* has been published by Sjöstedt.[1]

Dorylus (Anomma) wilverthi Emery

Plates II, III, and IV

This fine species, the workers of which are easily recognized by the elongated and divergent posterior corners of the head (Fig. 1*b*), is represented by a large series from Avabuki and a single small worker from Faradje; also by five workers from Medje and Akenge taken from the stomachs of toads, *Bufo polycercus* and *B. funereus* (Lang and Chapin).

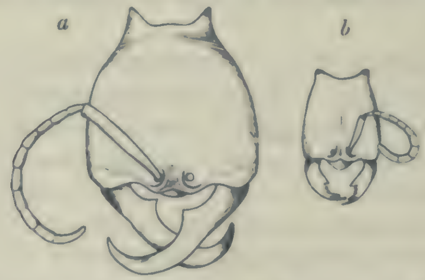

Fig. 1. *Dorylus (Anomma) wilverthi* Emery. *a*, head of soldier; *b*, head of worker.

The temporary nest is shown in Plate II, the ants massed on the ground in Plate III. Concerning these ants Mr. Lang says: "We had considerable trouble with them, for they started a nest near our camp at the base of a coffee bush where some pineapple plants were growing. I took two photos before burning the place. One shows the masses of army ants heaped on top of the other. It was impossible to see what they had beneath them, but after the fire, we found that they covered innumerable eggs and larvæ. The other photo shows the mounds or heaps of earth particles carried out by the workers. They come on steadily, each one with a particle of soil in its jaws, and, as soon as they arrive at the summit of the mound, they open their mandibles and the grain of sand rolls into place. After the fire they began to emigrate in enormous numbers, building their roads as they proceeded. There was one main line about an inch wide, excluding the soldiers. I followed this particular line for a distance of about 500 yards into the forest. Sometimes the ants seemed to have disappeared entirely into the ground, since they traveled in tunnels, but by searching I discovered their course some distance beyond. I was unable to ascertain where the huge army deposited its eggs and larvæ. For three days the workers carried larvæ and eggs out of the old nest. The brood was carried under the body so that it could not be seen by the superficial observer." These observations were made at Avakubi.

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[1] 1908, 'Akaziengallen und Ameisen auf den ostafrikanischen Steppen.' In Sjöstedt, Exped. Kilimandjaro, Meru, etc., II, 8, pt. 4, pp. 111–114.

Dorylus (**Typhlopone**) **fulvus** (Westwood) subspecies **badius** (Gerstæcker) variety **obscurior** Santschi

Vankerckhovenville, ♃, ☿, ♂; Faradje, ♃, ☿; Garamba, ☿; Batama, ♂; Stanleyville, ♂ (Lang and Chapin); Avakubi, ♂ (Lieut. Boyton). Both the worker and male of this form have a characteristic color. Santschi described only the worker from Konakry, French Guinea. The Congo specimens measure 5 to 13 mm. and have the head, thorax, petiole, and legs rich chestnut brown, the gaster brownish yellow, the mandibles and antennæ nearly black. The smallest workers are more uniformly brownish yellow. The differences in form between this and the typical *badius* of South Africa are slight. Santschi describes the head, the base of the epinotum, and the petiole as broader in *obscurior*. In my specimens the head of the soldier (Fig. 2a) closely resembles that of the variety *eurous* from East Africa as figured by Emery.

The males (Fig. 2*b-f*) taken from the same colony as the workers are also much darker than those of the subspecies *badius* and variety *eurous* or the typical *fulvus* from North Africa. They measure 33 to 36 mm., with the thorax somewhat less than 6 mm. broad, and are chocolate brown, with the head blackish and the gaster a shade paler than the thorax and petiole. The wing membranes are also of a little duller and deeper tint. The hairs and pubescence are less golden and less shining, more grayish. The male genitalia are intermediate in the structure of the stipes between those of the typical *fulvus* and the subspecies *badius*, as will be seen by

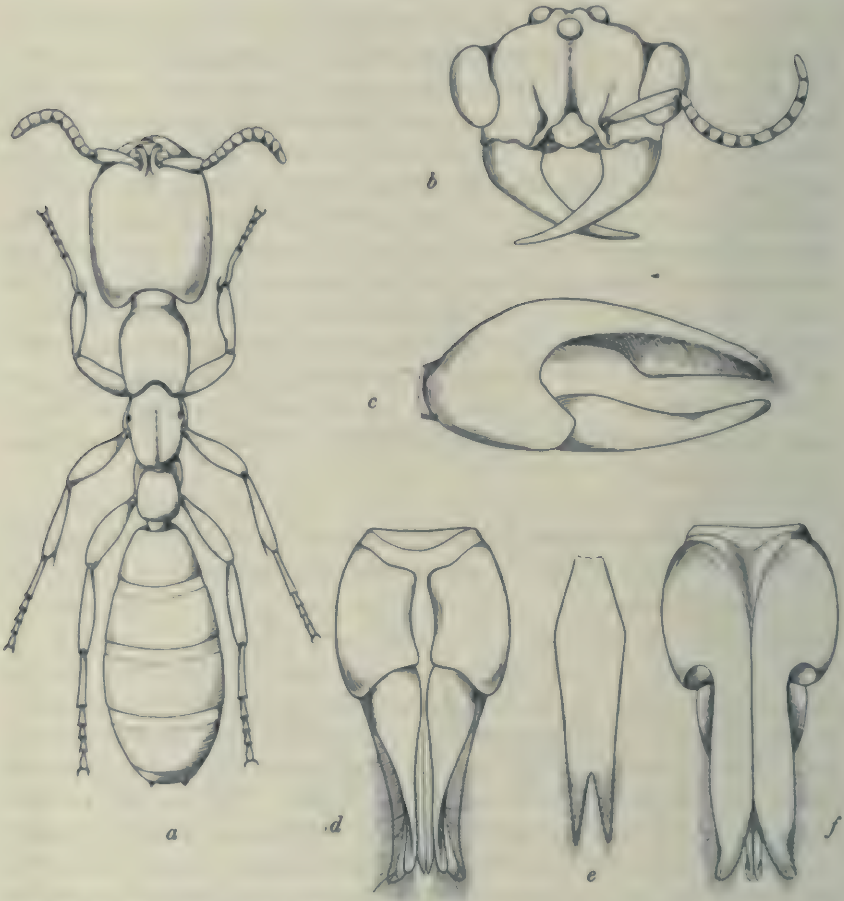

Fig. 2. *Dorylus* (*Typhlopone*) *fulvus* subspecies *badius* variety *obscurior* Santschi. *a*, soldier; *b*, head of male; *c–f*, genitalia of male.

comparing my figures with Emery's.[1] The specimens from Batama and Avakubi are distinctly paler than the others in the series but can hardly be regarded as belonging to a different variety.

Concerning the Vankerckhovenville colony from which both workers and males were taken, Mr. Lang writes: "These ants were collected on the floor of an Azande hut. The workers and big males were swarming out of a hole in the ground during the night. These driver ants are not annoying to human beings, but have subterranean habits. They never walk in columns on the surface like the others, but whenever a piece of meat or even a jar of oil is deposited on the ground they immediately appear from below, without a tunnel or a gallery being visible from the outside."

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[1] 1895, Zool. Jahrb. Abt. Syst., VIII, figs. *Q* and *R*, pp. 727, 728.

Dorylus (Alaopone) atriceps Shuckard

Text Figure 3

Three males from Faradje and two from Stanleyville (Lang and Chapin).

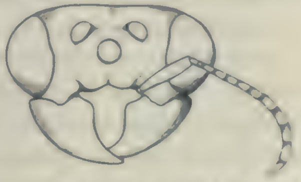

Fig. 3. *Dorylus (Alaopone) atriceps* Shuckard. Head of male.

Dorylus (Alaopone) conradti Emery

Five soldiers and ten smaller workers from Niangara (Lang and Chapin), taken from the stomach of a frog (*Hemisus marmoratum*), agree perfectly with Emery's description and figures of the types from Togo, except that the largest workers measure only 4.5 to 5 mm., whereas Emery's specimens attained a length of 6.5 mm. The soldier is easily recognized by the coarsely punctate thorax and the very elongate head, which, with the closed mandibles, is nearly twice as long as broad.

Cerapachyinæ

I have recently proposed to regard Forel's tribe "Cerapachysii" as constituting an independent subfamily, the larvæ of these ants being so different from those of the true Ponerinæ and much more like the larvæ of the Dorylinæ.[1] The limits of this new subfamily agree with those of Emery's section Prodorylinæ, and Emery was probably right in contending that the Cerapachyinæ are intermediate between the Dorylinæ and Ponerinæ.

The WORKER caste has a ponerine habitus, but is often long and slender. The postpetiole is separated from the third abdominal segment by a well-marked constriction, and as broad as the third segment. In the Indoaustralian *Eusphinctus* even the gastric segments are marked off from one another. A powerful sting is present.

The characters of the FEMALE in the various genera are peculiarly diverse. In some cases (*Phyracaces*), this caste is winged and not unlike the females of certain Ponerinæ; in others (*Parasyscia*, *Eusphinctus*), the female is wingless and ergatomorphic; and, in still others (*Acantho-*

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[1] Wheeler, Wm. M., 1920. 'The subfamilies of Formicidæ, and other taxonomic notes.' Psyche, XXVII, pp. 46–55.

stichus, *Nothosphinctus*), the female is so much like the corresponding caste in the Dorylinæ that it might be regarded as a dichthadiigyne. The MALE, on the other hand, though lacking the cerci, has a decidedly ponerine habitus. The male genitalia are completely retractile; the subgenital lamina deeply and broadly furcate.

The LARVÆ are extremely like those of the Dorylinæ; they are elongate and almost cylindrical, uniformly covered with short hairs, and without piliferous tubercles. The mandibles are small, narrow, pointed, and rather feebly chitinized, and I have failed to find a trophorhinium, or triturating organ in the mouth. Apparently the young are fed only on soft food. Moreover, the foraging habits at least of certain Australian Cerapachyinæ (*Phyracaces*) resemble those of the Dorylinæ.[1]

Dr. W. M. Mann has recently sent me specimens of his *Cerapachys majusculus* from Fiji, with several worker pupæ which are enclosed in well-developed, brown cocoons. The Cerapachyniæ seem, therefore, to agree with the Ponerinæ in this character.

CERAPACHYS F. Smith

WORKER.—Small ants with peculiar, long, subcylindrical body; the head excavated behind, with prominent, depressed posterior corners and very short clypeus, with which the closely approximated frontal carinæ are fused. The latter are erect, leaving the articulations of the antennæ exposed. The antennal fovea is bounded externally by a distinct carina. Mandibles with distinct, obscurely denticulate apical border. Antennæ stout, 9- to 12-jointed, the scape incrassated distally, the terminal funicular joint large, swollen, oval or glandiform, at least as long as the three preceding joints together, thus forming a one-jointed club. Eyes small, sometimes wanting. Thorax with the promesonotal and mesoëpinotal sutures absent or indistinct. Petiole and postpetiole not marginate on the sides, the latter strongly constricted off from the gaster which is largely formed by its first segment.

FEMALE scarcely larger than the worker and very similar, sometimes apterous and ergatoid. Fore wings when present with a discoidal and a single cubital cell.

MALE with the clypeus and frontal carinæ much as in the female. Antennæ filiform, 13-jointed; basal funicular joints short. Mesonotum without Mayrian furrows. Wing venation like that of the female.

The genus has been divided by Emery into four subgenera, distinguished by the number of antennal joints: *Cerapachys*, *sensu stricto*, having 12; *Parasyscia*, 11; *Ooceræa*, 10; and *Syscia*, 9. The distribution of these subgenera is peculiar. The species of *Cerapachys*, *sensu stricto*, are known to occur only in the Ethiopian, Malagasy, Indomalayan, and Papuan Regions; those of *Parasyscia* occur in Texas, Guatemala,

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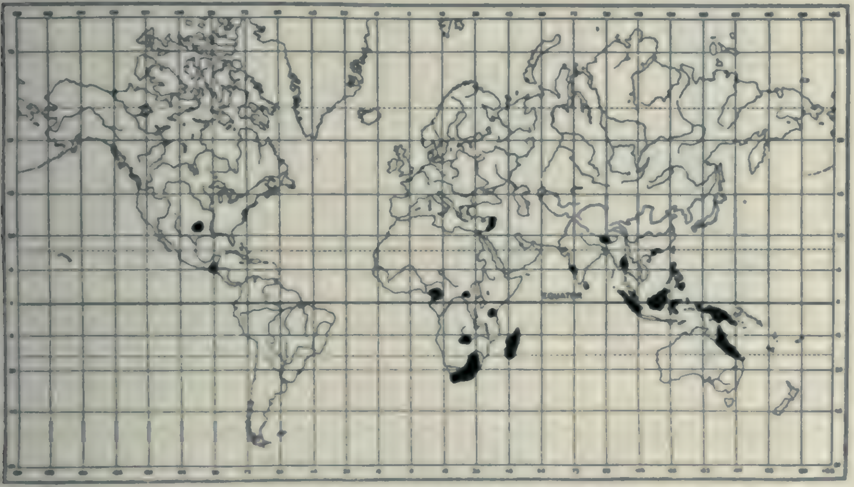
[1] Wheeler, Wm. M. 1918. 'The Australian ants of the ponerine tribe Cerapachyini.' Proc. American Ac. Arts Sc., LIII, p. 223.

Syria, Ceylon, India, and Burma; those of *Syscia* have been recorded from Ceylon, Singapore, New Guinea, Queensland, and Hawaii; while *Ooceræa* is known only from Ceylon. As these ants form small colonies and live a subterranean life, they are very rarely seen and this probably accounts for the peculiar discontinuous distribution in the accompanying map (Map 5). It seems hardly possible that species of *Cerapachys*, *sensu latiore*, are entirely lacking in South America, but none has been found in any of the many extensive collections that have been made on that continent. Practically all that is known of the habits of the genus is contained in a paper which I published many years ago on the Texan *Parasyscia augustæ* Wheeler.[1]



Map 5. Discontinuous distribution of the genus *Cerapachys*.

Cerapachys cribrinodis Emery

Two workers found in the stomach of a toad (*Bufo funereus*) taken by Lang and Chapin at Medje.

PHYRACACES Emery

Closely related to *Cerapachys*. The worker and female have 12-jointed antennæ. The terminal funicular joint, however, is not enlarged but tapers from the base to the tip and is not longer or scarcely longer than the two preceding joints together. The eyes of the worker are much larger than in *Cerapachys* and the sides of the petiole and often also of the postpetiole are strongly marginate. The female is winged or apterous and ergatoid; the male is known in certain Australian species.

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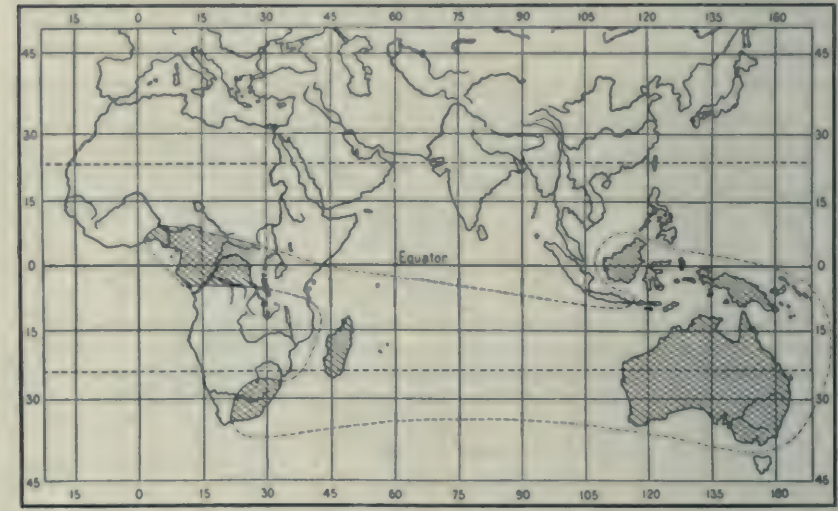
[1] 1902, 'An American *Cerapachys*, with remarks on the affinities of the Cerapachyinæ.' Biol Bull., III, pp. 181-191, 5 figs.

This genus is known only from the Ethiopian, Malagasy, Indomalayan, Papuan, and Australian Regions (Map 6) and is represented by the greatest number of species in Australia. The little that is known concerning the habits of the species is recorded in my paper entitled 'The Australian ants of the ponerine tribe Cerapachyini.'[1] The workers forage in small armies on the surface of the soil, like many Dorylinæ, and prey on other ants or possibly on any small insects they may encounter.



Map 6. Distribution of the genus *Phyracaces*.

Phyracaces langi, new species

Worker (Fig. 4).—

Length 4 to 5 mm.

Head subrectangular, a little longer than broad and a little broader behind than in front, its sides feebly and evenly convex, its posterior border broadly and rather deeply concave and somewhat truncated, the occipital border sharply marginate with the margination surrounding the blunt but projecting inferoposterior corners and continued forward along each side of the gula to the insertion of the mandible. Eyes moderately large, flat, in front of the middle of the head. Mandibles with slightly concave external and very finely and evenly denticulate apical borders. Carinæ of cheeks very prominent, in the form of blunt, rectangular teeth. Frontal carinæ erect, subparallel in front, more approximated but not truncated behind. Antennæ rather robust; scapes three-fifths as long as the head, slender at the base but rather abruptly enlarged before the middle; joints 2 to 9 of funiculus

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[1] 1918, Proc. American Ac. Arts Sc., LIII, pp. 215–265, 17 figs.

broader than long, tenth joint larger, distinctly longer than broad, terminal joint tapering, not broader than the preceding and not longer than the two preceding joints together. Thorax subrectangular from above, about twice as long as broad, a little broader through the epinotum than more anteriorly, evenly convex above, without traces of dorsal sutures, truncated and sharply marginate anteriorly and posteriorly. The margination separating the base and declivity of the epinotum is enlarged to form a small blunt tooth on each side. The lateral borders of the dorsum are indistinctly marginate, especially in the epinotal region, but the sloping epinotal declivity is sharply marginate laterally. Petiole as broad as the epinotum, rectangular, about one and two-thirds as broad as long, with bluntly dentate posterior corners, marginate in front and on the sides, with truncated, slightly concave anterior, feebly convex dorsal and sloping posterior surface. Ventrally in front it bears a large, triangular, compressed, subtranslucent tooth. Postpetiole as broad as the petiole, as long as broad, very regularly rectangular, flattened above, with only its anterior border marginate. First gastric segment a little larger than the postpetiole, of a similar shape but broader than long, anteroventrally with a blunt tooth or tubercle. Pygidium subcircular, truncate, minutely and indistinctly spinulate on the sides. Legs rather slender, hind coxæ with a large rounded, translucent expansion at the tip on the inner side.

Shining; mandibles coarsely and sparsely punctate. Head with a large, smooth and very shining space on each side between the eye and frontal carinæ; remaining surface with coarse, elongate punctures or foveolæ and posteriorly with a few coarse rugæ. Thorax above and on the sides rather regularly longitudinally rugose, with indications of elongate foveolæ on the humeri and truncated anterior surface; epinotal declivity more finely and regularly longitudinally striated. Sculpture of petiole above similar to that of the thoracic dorsum but with more numerous elongate foveolæ in the interrugal spaces; on the postpetiole the foveolæ are larger and more abundant and the longitudinal rugæ much less distinct; first gastric segment, pygidium and posterior portions of remaining segments coarsely and evenly punctate, the basal portions of these segments more shining and very evenly striolate. Scapes finely, legs more coarsely and much more sparsely punctate.

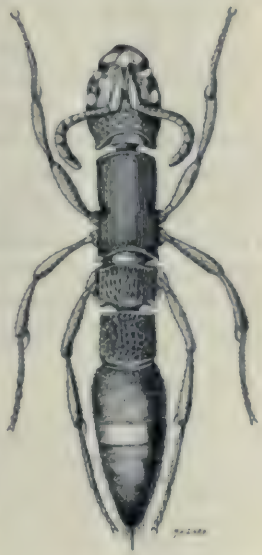

Fig. 4. *Phyracaces langi*, new species. Worker

Hairs grayish, bristly, suberect, moderately long, rather evenly distributed on the body, more abundant on the tip of the gaster, more appressed on the legs; tibiæ and scapes with a few long, suberect hairs. Pubescence short, visible only on the punctate portions of the gaster.

Black; mandibles, antennæ, legs, tip of gaster and sting piceous, coxæ and middle portions of femora and tibiæ darker.

FEMALE.—

Length 5 to 5.5 mm.

Very similar to the worker. Pronotum coarsely foveolate; mesonotum small, flat, somewhat pointed anteriorly, with its rugæ converging in front. Postpetiole distinctly broader than the petiole and a little broader than long. Wings whitish hyaline, with very pale yellow veins and large, conspicuous, dark brown pterostigma.

Described from seven workers and eight females taken from a single colony at Lubila, "nesting in a mushroom-shaped termitarium against a tree in the forest" (Lang and Chapin).

Of the four described Ethiopian species of *Phyracaces*, *langi* is most closely related to *P. foreli* Santschi of the Gold Coast. The worker of this species, however, measures only 3.5 mm. and, judging from Santschi's description, has a nearly straight occipital border, shorter antennal scapes, and different sculpture, especially of the head, petiole, and postpetiole. His figure of the petiole shows much longer posterior teeth than in *langi*. The specimen from Samkita, Gaboon, described by Santschi as the female of *foreli* measures 4 mm. and is so different from the worker in the shape of the petiole that I feel sure that it belongs to a distinct species, which may be designated as **Phyracaces santschii**, new species.

Ponerinæ

Postpetiole separated from the third abdominal segment by a constriction which is more or less marked (except in the Odontomachini and in certain males of Ponerini), almost always as broad as the third segment (except in *Myrmecia* and a few others). WORKER and FEMALE with a powerful sting. As a rule there is a stridulating organ on the basal surface of the tergite following the postpetiole; it consists of very fine transversal striæ of the articulating surface. Median spur of the tibiæ pectinate, when present, except on the middle tibiæ of a few genera; lateral spur simple. Fore wing as a rule with two closed cubital cells; but there are many exceptions.

The dimorphism of the worker is feebly marked (except in *Megaponera fœtens*, where it is very pronounced) and the female as a rule is not very different from the worker; ergatoid females exist in many genera. In a few cases the MALE has no constriction behind the postpetiole; such males can usually be recognized from male Dolichoderinæ by the feeble development of the mandibles. Ergatoid males are known for certain Ponerini.

LARVÆ with the mandibles powerfully developed for ant larvæ; the anterior portion of the body long, slender and neck-like, folded over the swollen abdominal portion; the segments are either densely hairy all over or covered with rows of peculiar tubercles beset with more or less prominent bristles; the larvæ of *Megaponera* and *Bothroponera* are hairless.

NYMPHS enclosed in a resistant cocoon, which may be opened by the adult without intervention of the worker. The West African *Discothyrea oculata* Emery is the only case in which the nymphs are described as having no cocoon.

In the Ponerinæ the larvæ are nearly always fed with pieces of solid food, which is almost invariably animal matter. Arnold says that *Euponera sennaarensis* (Mayr) is possibly an exception to the rule:

This ant preys unceasingly on termites, but its nest very often contains considerable accumulations of grass seeds, which may perhaps be used as food.[1]

The economic value of the Ponerinæ in tropical countries can hardly be overestimated, for it may be safely asserted that at least 80 per cent. of their food consists of termites, and they thereby constitute one of the chief checks to these pests of the tropics. Certain species are exceptional, such as *Plectroctena mandibularis*, which feeds chiefly on millipedes and beetles, and *Platythyrea arnoldi* Forel, whose food consists entirely of small beetles, mostly Tenebrionidæ.

The colonies are usually small in ponerine ants, but may be very numerous in some species, such as *Paltothyreus tarsatus*, *Megaponera fœtens*, *Euponera sennaarensis*, many species of *Leptogenys* and *Odontomachus hæmatoda*.

The habit of foraging in files has been observed in several species of Ponerinæ in different parts of the world. In our region this habit is displayed by *Megaponera fœtens*, and to a slight extent by *Paltothyreus tarsatus*. The former marches in double file, and the striking disparity in size between the two forms composing the colony has a very singular appearance. Their prey consists entirely of termites, and when a suitable hunting-ground containing these animals has been found, the columns break up and pour into every hole and crack which leads to the invaded galleries. The method then adopted is as follows: each ant brings to the surface one or more termites, and then re-enters the galleries to bring up more victims. This is continued until each ant has retrieved about half a dozen termites, which, in a maimed condition, are left struggling feebly at the surface. The whole army reassembles again outside and each marauder picks up as many termites as it can conveniently carry, usually 3 or 4. The columns are then re-formed and march home. Less order is shown by *P. tarsatus*, but I have often seen this ant carrying termites, in short single files composed of about a dozen workers. (G. Arnold, *op. cit.*, pp. 7–8).

PLATYTHYREA Roger

WORKER.—Small or medium-sized, slender, monomorphic, opaque black ants, with pruinose surface and very poorly developed pilosity, with flat clypeus often without a posterior suture, indistinct frontal area and large, thick, expanded and widely separated frontal carinæ. Mandibles large, triangular, with edentate or finely denticulate apical border. Maxillary palpi 6-jointed, labial palpi 4-jointed. Antennæ stout, funiculi without a distinct club. Eyes rather large; ocelli absent. Promesonotal suture distinct, other thoracic sutures feeble or obsolete. Petiole massive, not squamiform, its posterior articulation at the middle of the anterior surface of the petiole. The constriction between the latter and the gaster moderately pronounced. Middle and hind tibiæ with two spurs; claws with a single tooth.

FEMALE winged, very similar to the worker and but little larger; eyes larger, but ocelli not always developed. Pronotum large; mesonotum depressed. Wings with two closed cubital cells, a discoidal cell and a closed radial cell as in many other Ponerinæ.

MALE more like the female than in most genera of the subfamily; clypeus more convex than in the worker and female; frontal carinæ not dilated anteriorly. Mandibles triangular, with sharp apical border. Antennæ 13-jointed; scape a little shorter than the second funicular joint. Eyes and ocelli very large. Pronotum large, not overarched by the mesonotum, the latter convex, with indistinct Mayrian furrows. Petiole much as in the worker. Pygidium rounded; cerci developed.

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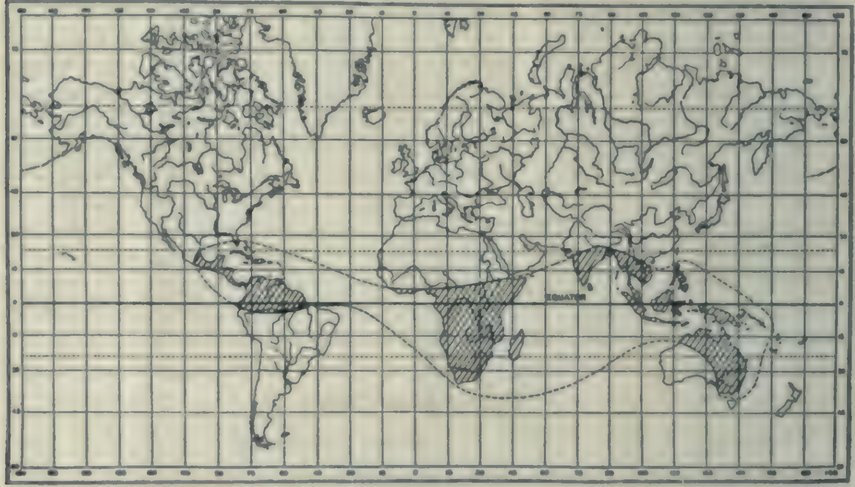
[1] 1915, Ann. South African Mus., XIV, p. 7.

This genus, of which more than 35 species are known, ranges over the tropics of both hemispheres (Map 7) and is represented by more species in Africa and Madagascar than in the Indoaustralian or Neotropical Regions. Our American and many of the African species seem to feed largely or exclusively on termites. I have found *P. punctata* (Smith) of the West Indies nesting in termitaria. Arnold gives some notes on the habits of two of the African forms. Of *P. lamellosa* (Roger) subsp. *longinoda* Forel variety *rhodesiana* Forel he says:



Map 7. Distribution of the genus *Platythyrea*.

> The nest of this species is so distinctive that it cannot be mistaken for that of any other Ponerinæ. The entrance is surmounted by a dome, from 6 to 8 inches high, by about 12 inches broad at the base. The dome is built up of very even-sized small pebbles, about 5 to 8 mm. in their largest diameter. The entrance is situated in the center above, and this is generally the only entrance, very exceptionally there may be a smaller and less regular opening at the base of the mound.

He gives the following account of *P. arnoldi* Forel:

> I have met with this species on only one occasion. The nest, situated on an open piece of ground, was surmounted by a mound with the entrance at the apex, as in *lamellosa* variety *rhodesiana*, but unlike that species the mound of *arnoldi* contains no large pebbles. The surface of the mound was covered with the elytra and carcasses of hundreds of beetles, mostly Tenebrionidæ. Workers were seen carrying live beetles to the nest, the prey being held by its mandibles in a position above and parallel to the body of the ant. Since a careful examination of the rubbish-heap of this nest

failed to show the remains of other insects, it is probable that this species feeds entirely on Coleoptera, differing in this respect from most of the other members of the genus, which in Rhodesia, at any rate, are entirely termitophagous.

Platythyrea conradti Emery

A single worker from Risimu (Lang and Chapin).

Platythyrea gracillima, new species

Worker (Fig. 5*a* and *b*).—

Length 9 mm.

Very slender. Head, excluding the mandibles, fully one and one-half times as long as broad, a little broader in front than behind, with very feebly convex sides and feebly excised posterior border. Mandibles rather long, moderately convex, their apical border with about 10 distinct teeth. Clypeus large, rather flat, more convex in the middle behind, with broadly rounded, entire anterior border and distinct posterior suture. Frontal carinæ very prominent, fused posteriorly. Eyes small, a little in front of the middle of the sides of the head. Antennal scapes long and stout, extending fully one-fourth their length beyond the posterior corners of the head; funiculi lacking, except the first joint, which is three times as long as broad. Thorax long and narrow, laterally compressed, especially in the meso- and epinotal regions; broadest through the pronotum, which is as broad as long and as broad as the head, rounded in front and on the sides. Mesonotum longer than broad. Promesonotal suture very distinct, mesoëpinotal suture obsolete. In profile the dorsal outline of the thorax is nearly straight and horizontal; the base of the epinotum nearly twice as long as the declivity. The latter is abrupt, submarginate on the sides, which are obtusely angulate. Petiole laterally compressed; seen from above a little more than twice as long as broad, with straight, parallel sides; in profile evenly rounded in

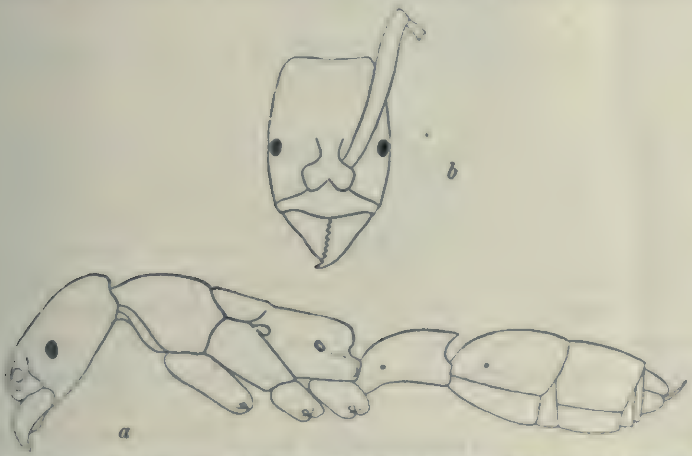


Fig. 5. *Platythyrea gracillima*, new species. Worker. *a*, lateral view of body; *b*, head of same from above.

front, straight above and very sharply and deeply concave behind, the ridge between the dorsal and posterior surface being narrow, transverse and feebly emarginate in the middle. At its posterior end the petiole is fully three-fifths as high as long. Postpetiole distinctly longer than broad, as broad as the gaster behind and not separated from it by a perceptible constriction, narrowed to the breadth of the petiole in front. First gastric segment as long as broad, the remaining segments short, telescoped into it. Legs rather long.

Slightly shining; mandibles more shining, finely and densely punctate; remainder of body even more finely and densely punctate; with a few larger, but very shallow and indistinct, superadded punctures on the head, thorax and petiole.

Hairs absent; pubescence yellowish gray, very short and fine, rather evenly distributed like dust over the whole body and the appendages, longer and more oblique on the mandibles.

Black; mandibles, clypeus, frontal carinæ, antennæ, legs, including the coxæ, posterior corners of the head, dorsal surface of pronotum, epinotum and petiole, and posterior border of postpetiole and first gastric segment, red; remaining gastric segments yellow.

Described from a single rather poorly preserved specimen from Avakubi (Lang and Chapin), taken from the stomach of a toad (*Bufo regularis*).

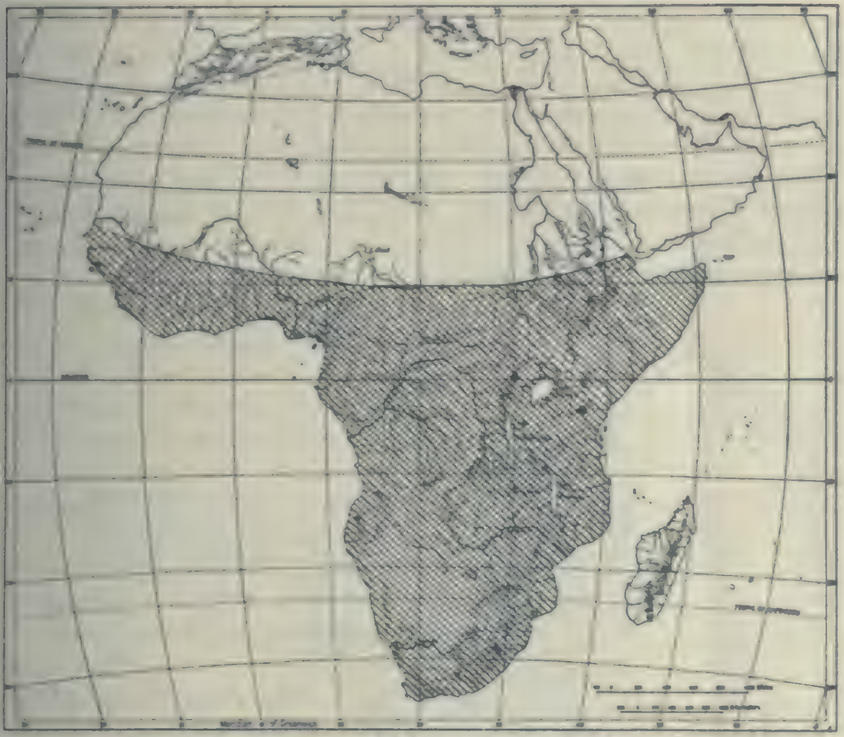
This species is unlike any of which I have seen specimens or descriptions in the shape of the head and body and especially of the petiole and gaster. In certain respects it approaches *viehmeyeri* Santschi of German East Africa, but is much smaller (*viehmeyeri* measures 13 mm.), and has densely punctate instead of striolate and sparsely punctate mandibles; the latter are denticulate; the head and antennæ are longer; the thorax not submarginate on the sides; the pronotum is not longer than broad; the mesonotum is longer than broad; the color is very different; etc.

Paltothyreus Mayr

Worker.—Large black ants, with monomorphic workers. Clypeus in the middle with an elevated lobe, which is truncated anteriorly and projecting over the anterior clypeal border, marginate on the sides, excavated in the middle and extending back like a spearhead between the frontal carinæ which are moderately dilated and subtriangularly lobate. Mandibles elongate, triangular, their apical borders finely denticulate. Antennal funiculi slightly thickened distally. Eyes situated in front of the middle of the head. Thorax unarmed, not impressed dorsally; promesonotal suture distinct, mesoëpinotal suture obsolete dorsally. Petiole surmounted by an erect scale. Constriction between the postpetiole and the gaster feeble; gaster rather long. Claws with a tooth in the middle.

Female very similar to the worker but considerably larger and winged; thorax depressed, pronotum broadly exposed.

Male with triangular clypeus furnished near its anterior border with a small conical tubercle; its posterior portion not prolonged backward between the antennal insertions. Antennæ long, scape much shorter than the second funicular joint.



Map 8. Distribution of *Paltothyreus tarsatus* (Fabricius).

Pronotum above largely exposed; mesonotum with traces of Mayrian furrows. Petiole surmounted by a thick node, its ventral surface convex, but not toothed. Postpetiole anteriorly with a strong tooth. Pygidium acutely pointed but not prolonged into a spine.

This genus is monotypic, the single species *P. tarsatus* ranging over the whole of the Ethiopian Region (Map 8) as one of its most conspicuous and characteristic ants.

Paltothyreus tarsatus (Fabricius)

Text Figure 6

Of this species, which has been repeatedly described by previous authors, Lang and Chapin collected a number of single specimens from the following localities: Yakuluku, ☿; Stanleyville, ☿, ♂; Medje, ☿; Risimu, ☿; Leopoldville, ☿; Bafwasende, ☿; Bafwabaka, ☿; Faradje, ☿; Niangara, ☿, ♂.

In addition to these, 135 workers and 5 deälated females were taken from the stomachs of four species of toads (*Bufo funereus, tuberosus,* *superciliaris*, and *polycercus*) captured by Lang and Chapin in the following localities: Niapu, ☿; Niangara, ☿; Ngayu, ☿; Medje, ☿, ♀, ♂; Avakubi, ☿; Akenge, ☿, ♀; Garamba, ☿; Gamangui, ☿; also a single worker from Faradje taken from the stomach of a frog (*Rana occipitalis*).

It is surprising to find that this large ant is represented by a greater number of specimens than any other species in the toad stomachs examined, for the insect is provided with a very formidable sting, is swallowed without mutilation, and can hardly be killed very quickly by the weak gastric fluids of the amphibians.

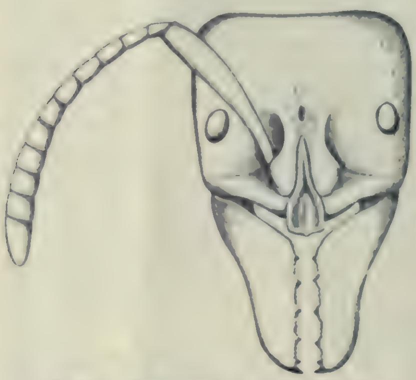


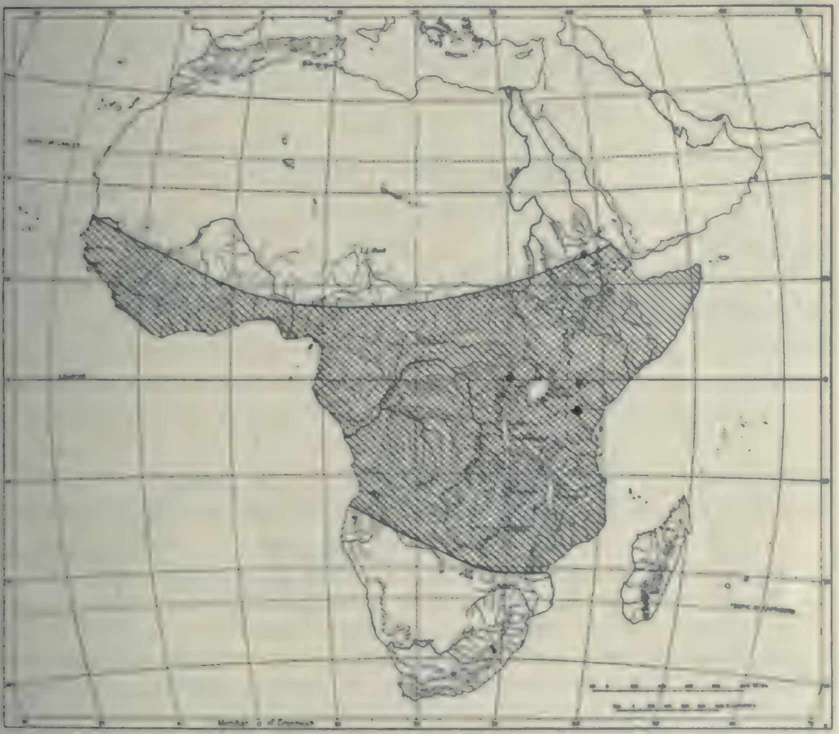
Fig. 6. *Paltothyreus tarsatus* (Fabricius). Head of worker.

Concerning the habits of *P. tarsatus*, Arnold writes: "This species is widely but locally distributed. Generally the worker and female go about singly, but occasionally forage in short columns, in single file. The food is varied but consists largely of termites. The nests have several entrances, which are sometimes surrounded by large heaps of finely divided earth. The species has a most powerful and offensive smell, which appears to me to resemble that of the juice in a foul tobacco pipe." According to Santschi this species "répand une abominable odeur de charogne."

One of the worker specimens from Medje and one from Niangara had a long *Cordyceps* growing out of the side of the thorax. These ants were attached to sticks with their mandibles, a common condition in ants that die from the attacks of these and other fungi. Dr. Bequaert says that "dead specimens of *Paltothyreus tarsatus* thus parasitized are sometimes found, fixed with the mandibles to a leaf or grass-stalk. The fungus has been referred to *Cordyceps myrmecophila* (Cesati), of the family Hypocreaceæ. Its fructification usually grows out between the coxal articulations, on a slender stalk about 2 cm. long and ending in a club-shaped organ which bears the ascocarps" (See part IV).

MEGAPONERA Mayr

WORKER.—Rather large black ants with distinctly dimorphic workers, the minor forms having the antennæ shorter and with more transverse funicular joints and the surface of the head and thorax usually smoother and less pubescent. Clypeus rounded in front and extending backward in a point between the frontal carinæ, which are rather long, continued posteriorly to a level with the eyes and moderately dilated and lobular anteriorly. Cheeks carinate. Mandibles, long, deflected, triangular, with multidentate apical border. Antennal scapes flattened. Eyes a little in front of the middle of the sides of the head. Pronotum long; mesonotum surrounded by a strong suture. Petiole surmounted by a subcuboidal node, its ventral lamella with a blunt, backwardly directed tooth. Constriction between postpetiole and gaster rather feeble. Middle and hind tibiæ with two well-developed spurs, one of which is pectinated; claws with a tooth near the base.



Map 9. Distribution of *Megaponera fœtens* (Fabricius).

FEMALE wingless and ergatomorphic, larger and somewhat more coarsely sculptured than the worker major, with much more voluminous gaster and the petiole almost squariform and inclined forward.

MALE nearly as large as the worker major, with convex clypeus, not prolonged backward between the frontal carinæ. Mandibles very short, blunt and edentate. Antennal insertions farther from each other than from the sides of the head; scape longer than the second funicular joint. Eyes occupying less than half the sides of the head, their inner orbits slightly emarginate. Posterior border of head strongly marginate, somewhat colliform. Mesonotum prominent, twice as long as the pronotum, without Mayrian furrows. Ventral lamella of petiole with an acute posteriorly directed tooth behind the middle. Pygidium not spined. Claws with three or four minute basal teeth. Wings short, with a discoidal cell, two cubital cells and a closed radial cell.

This genus, like *Paltothyreus*, is monotypic and has much the same distribution, the single species, *M. fœtens* (Fabricius), ranging over a large part of the Ethiopian Region (Map 9).

Megaponera fœtens (Fabricius)

Plate VI, Figure 2

Zambi, ☿; Niangara, ☿, ♀; Rungu, ☿; Avakubi, ☿; Faradje, ☿; Panga to Banalia, ♂; Boyulu, ☿; Niapu, ☿; Garamba, ☿; Akenge, ☿; Gamangui, ☿ (Lang and Chapin); Malela, ☿ (J. Bequaert).

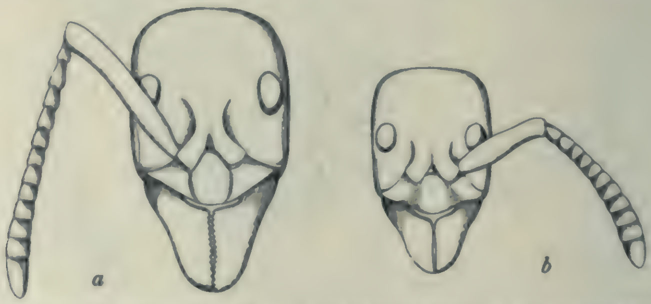


Fig. 7. *Megaponera fœtens* (Fabricius). *a*, head of large worker; *b*, head of small worker; both drawn to the same scale.

Seventeen of the specimens from Boyulu, Niapu, Garamba, Akenge, and Gamangui were taken from the stomachs of four species of toads (*Bufo funereus*, *superciliaris*, *regularis*, and *polycercus*) and a male from Faradje was taken from the stomach of a frog (*Rana occipitalis*).

The smaller individuals have the vertex and pronotum very shining, the mandibles toothless, and the funicular joints of the antennæ much shorter and more transverse than in the larger workers (Fig. 7*a* and *b*) and were therefore formerly regarded as a distinct species (*M. crassicornis* Gerstæcker). A worker media was also described by Emery as a distinct species, *M. dohrni*. At one time he interpreted the smaller individuals as the true workers and the larger as ergatomorphic females. Arnold, who found this view improbable for the reason that the large are about four times as numerous as the small individuals in the colony, has recently discovered the true female.[1] It is of the ergatomorphic type, with a slender wingless thorax like the large worker and measures 18.5 mm. The petiole, however, is squamiform and not cuboidal as in the worker and the gaster is much more voluminous. It therefore resembles the females of *Leptogenys* (subgen. *Lobopelta*) and *Onychomyrmex* which I have described in former papers.

Armies of *Megaponera* were frequently observed by Mr. Lang preying on termites or carrying the larvæ and pupæ in files, sometimes of 300 or more individuals. In the literature there are some interesting accounts of the habits of this ant.[2] Wellman observed it in Benguela and informed Forel of its habit of marching in populous columns.[3] In a later paper[4] Forel published some observations of Prell on the same ant in German East Africa. He found it running in single file on the road. Most of the larger individuals were carrying worker and soldier termites in their jaws and Prell was struck both by the sonorous stridulation of the army and by its strong odor, which resembled that of oil of bitter almonds and was imparted to the alcohol of the vial in which the specimens were preserved. Similar observations were made by Bequaert in the Katanga.[5]

A more detailed, though incomplete, account of a raid on termites is given by Alluaud and Jeannel in Santschi's paper on the ants they collected in East Africa:

> When they are disturbed and run away the *Megaponera fœtens* stridulate, and the noise made by a troop of them can be heard at a distance of several meters. We noticed this on several occasions, particularly at Fort Hall and New Moschi. At the latter station on the morning of April 10, 1912, in a corner of the forest at the edge of the Rau River, we encountered a troop of several hundred *Megaponera* marching in a column several abreast, apparently moving with decision to a predetermined goal. They descended the bank of the stream, stridulating loudly. We were unfortunately busily occupied at this spot collecting a lot of large *Papilio* which came down to the river to drink, so that we did not think of following the *Megaponera* army. An hour later these ants returned in good order in the reverse direction, each of them carrying

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[1] 1915, Ann. South African Mus., XIV, p. 48, footnote, fig.

[2] Livingstone in his celebrated 'Missionary travels and researches in South Africa,' 1859, pp. 576–577, has given what is apparently the earliest account of the termite hunting Ponerinæ of Central Africa. His description of their foraging parties is remarkably accurate; he even mentions that "when disturbed, they utter a distinct hissing or chirping sound."

[3] 1909, Ann. Soc. Ent. Belgique, LIII, p. 64. In Entomological News, XIX, 1908, p. 33, F. C. Wellman gives an account of what is evidently a raiding party of *Megaponera fœtens*, but unfortunately calls the ant "*Polyrhachis militaris cupreopubescens*."

[4] 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361. See also Prell, H., 1911, 'Biologische Beobachtungen an Termiten und Ameisen,' Zool. Anzeiger, XXXVIII, pp. 243–253.

[5] 1913, Rev. Zool. Afr., II, p. 422.

> in its mandibles a whitish pellet consisting of dead termites glued together with saliva. Some of them carried as many as ten to twelve termite workers thus agglutinated, others only two or three soldiers; one carried a dealated male, possibly the king of the plundered termitarium. The number of termites in a pellet varied with its size, but not an ant returned without something. While collecting a number of these *Megaponera fœtens* with their booty we experienced the effect of their sting, which is lancinating and very painful but very transitory.

In his monograph of the Formicidæ of South Africa (*loco citato*, p. 47) Arnold says:

> It is a common ant in Rhodesia and lives almost exclusively on termites, which are carried off by means of carefully arranged raids in which the ants march in double file. This is the species which is popularly called the "Matabele" ant, and like its cousin *Paltothyreus*, it is also endowed with a very offensive odor. They stridulate very loudly when disturbed, and their sting is exceedingly painful. The entrance to the nest consists of one or more simple holes without any mounds of earth around them.

In the Proceedings of the Rhodesian Scientific Association, XIII, 1914, p. 26 et seq., Arnold has recently published a fascinating description of the extraordinary way in which the Matabele ant changes its nesting site and is followed by its numerous guests. I quote the greater part of his account, as the journal in which it appeared may not be accessible to my readers:

> This is eminently a termitophagous species, and it is likely that it changes the site of its nest more often than is the case with the majority of our ants. When we bear in mind how continuous their assaults are on the colonies of termites, it seems very probable that the supply of the latter insects may be so diminished within the practical range of the camp of the raiders that the latter may find it advantageous to move their quarters from time to time to new and more fruitful country. The migration of this ant which I am about to describe is of particular interest, apart from the behavior of the guest insects, because it was the occasion of the discovery of the true queen of the species. * * *
>
> My attention was attracted to this migration by seeing a mass of these ants assembled together with their larvæ and pupæ, in the open. On one side, many workers were to be seen bringing along the larvæ in their jaws, on the other side of this mass a few workers were moving in the other direction, in a somewhat hesitating manner. Following the track backwards, I came to the site of the old nest, situated about 15 feet away. Returning to the camp, it was seen that some workers had started to pick up the larvæ again, and were carrying them yet further away from the original nest, only to be laid down again at about another 15 feet further away. Subsequent observations showed that the migration was carried out in three stages, three temporary camps being formed between the old and the new nests, which were about 60 feet apart. The method adopted by the insects was as follows. First of all, the eggs, larvæ, pupæ and males were taken from the old nest and put down at the first camp, from which many workers were to be seen hurrying back to fetch away the rest of their charges. In the meantime, a few workers were to be seen pacing up and down on the other side of the camp. They did not carry any larvæ and it would almost

seem as though they had some idea of the numerical composition of the colony, and of what the volume of the first camp should be, before the old nest could be considered to have been emptied by its inhabitants, and the proper moment to have arrived for another start to be made. However, after about six or seven minutes, the march recommenced; and within a short time the second camp had been made at a distance of about 15 feet from the first. Similarly a third and last camp was formed further on. It was while the first camp was about to break up that I saw an insect then much larger than the largest worker, and which, when captured in the third camp, proved, to my surprise, to be the queen.

The entrance to the old nest was a hole about 1 inch across, which ran down vertically for about 5 inches and then branched off at an angle. Looking down this hole, the various guests and parasites could be seen climbing up the walls in an almost continuous stream, hastening to join their hosts in their new home. These insects comprised a *Lepisma*, two species of staphylinid beetles, a histerid beetle and an onthophagous beetle; there was also a spider. The Lepismas as usual were very plentiful; of the larger staphylinid I saw only one specimen, but of the smaller sort and of the other beetles very many examples occurred, and during the half hour or so through which I watched the procession, about two dozen specimens of the spider were counted. Had it been possible to have cinematographed the scene, it would have furnished us with a film of surpassing interest. Here, as in the case of *Myrmicaria*, the myrmecophiles were able to follow the tracks of their hosts without any delay or uncertainty. Occasionally one of the smaller staphylinids would leave the beaten track for a short distance and then return to it again a little further on, but to the majority of these commensals, the odour of their hosts had laid down a path as clearly marked as a macadamized road would be to our eyes, so that with the above exception, it was rare to see any of these insects swerve from the line of march by as much as an inch.

This motley crew of cringers, thieves, murderers and body-snatchers did not appear to attract the slightest attention from their victims the ants, which were too busy with the work in hand to waste any time on the rabble following in their wake. Of all this crowd, the spiders alone were able to keep pace all the time with the ants, but the slowest, the very small histerid, even at its most feverish pace, did not succeed in covering more than 2 inches per minute, so that it would have arrived at the new nest about six hours after leaving the old. Those beetles which managed to reach the different camps, while these were still intact, buried themselves in the heap of larvæ and cocoons, where they remained until the gradual depletion of the mass made it clear that they had not arrived at the site of the real nest and that another wearisome journey had to be made to attain their goal.

The spiders moved about in the camps in a very easy and unconcerned manner, making no attempts to hide under the piles of cocoons. They ran over the backs of the ants, mingling in a friendly way with the crowd; yet even in the hurry and bustle of this march, it was not possible for these animals to conceal entirely their method of earning a living. A worker ant, carrying a larva in its jaws, was seen just about to pass a spider standing on the edge of the camp. The spider ran up to the worker, stroked it with its front pair of legs for a second or two, and then plunged its fangs into the larva. The latter was released by the ant after a little hesitation, and within five minutes had been sucked dry by the spider. We know that there are many ant parasites which live chiefly on the young of their hosts; but usually these insects offer, on various parts of their bodies, those bribes in the shape of trichomes which make the ants careless of, or oblivious to the true nature of their guests. On the other hand, there are the synœketes, or indifferently tolerated guests, with which perhaps the histerid and onthophagous beetles found on this occasion should be classed, which do not usually bear trichomes. They owe their immunity from attack on the part of the ants, either to their insignificant size, or to their awkward shape, which prevents the ants from seizing hold of them. But it is difficult to understand how the spiders can live unmolested in the nests of such a powerful and vicious ant as *Megaponera fœtens* and be allowed to feed on the larvæ, without apparently the mildest protest. They do not possess trichomes, nor are they so constructed, by smoothness or hardness of texture, as to prevent the ants from seizing hold of them.

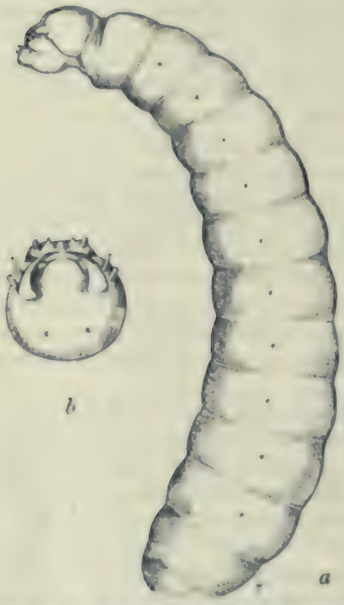

Fig. 8. *Megaponera fœtens* (Fabricius). *a*, nearly adult larva, lateral view; *b*, head of same, dorsal view.

The staphylinids are probably to be placed in the category of synechthrans, or inimically persecuted intruders, which includes a number of insects which skulk about ants' nests, and get a living by rummaging about in the refuse heaps or kitchen-middens, or by attacking solitary workers in the lonely corners and by-ways of the settlement. * * *

In conclusion, it should be pointed out that in these latitudes, migrations of ants can be expected to take place only after sunset, or if earlier, only on dull and cloudy days, as was the case with *Megaponera*, since the delicate larvæ cannot bear a lengthy exposure to the rays of the sun.

Two of the vials of *Megaponera* collected by Mr. Lang contained a number of cocoons and larvæ in various stages, so that, on reading Arnold's account, it seemed probable that the brood might show adaptations to being carried about and exposed to the sunlight. A study of the material shows that such adaptations can be detected. The larvæ (Fig. 8a and *b*) are grayish white, long and subcylindrical, and only slightly curved, with strongly marked segments and with smooth, remarkably tough integument, which is quite hairless in all stages, a condition I have never observed in any other ant larva. The head is very large, rounded, strongly chitinized, and terminal, with long, acute, falcate, edentate mandibles, minute vestiges of antennæ, and very prominent tactile sensillæ on the maxillæ and labium. The size of the head and mandibles shows that the larvæ are fed on pieces of termites and not with regurgitated liquid food, and the strong integument is evidently an adaptation to exposure to the air and light and to the exigencies of frequent and protracted transportation in the powerful denticulate jaws of the workers. The nudity of the integument indicates that even the very young larvæ are carried singly and not in bunches held together by interlocking hairs as in most other species of ants. The cocoons are black and remarkably tough, characters which I have observed in certain Australian Ponerinæ of the genera *Diacamma* and *Rhytidoponera* as adaptations to exposure to sunlight.[1] This interpretation is confirmed by Mr. Lang, who, without knowing of my observations, informed me that he was surprised to find *Megaponera* often exposing its dark cocoons in heaps to the sunlight.

Recently, in a letter to Prof. Poulton,[2] G. D. H. Carpenter records some additional observations which he was able to make on *M. fœtens* southwest of Lake Victoria:

> I see a good deal of the ant *Megaponera fœtens* here: one is always coming across their long, solemn, slowly marching, black processions—of any number from 50 to 500 or so. I have never seen them carrying any other booty but the species of termite which abounds here—the one I have alluded to before. It lives underground and makes no hills—coming out of little holes and running about, uncovered, in the open, to get bits of live or dead grass which it carries down the holes. Presumably in correlation with its open-air habits, its color is much darker than the large termite whose hills I used to destroy on the islands, and which devoured my house. This one does not attack wooden posts nor does it make covered runs. Curiously enough, I have never seen any soldiers, which is perhaps why *Megaponera* wages such ceaseless war against it. This ant, when it goes out in column, wanders about looking for the termite holes. Immediately one is found there is great excitement. The little bits of grass which sometimes plug the entrance are dragged out, and the ants scramble down the hole very shortly reappearing with termites, feebly struggling in their jaws. Sometimes there seems evidence of an underground barricade, as ants come up to the surface with bits of dead grass, etc., as if they were breaking down hastily erected barricades! One can almost picture the termites hastily throwing up partitions of grass and earth to keep back the invaders. It would be interesting to know if the reason why *Megaponera* is absent from some parts, is because this particularly defenceless termite is absent also.

Bothroponera Mayr

Worker.—Small, medium-sized or large, opaque or subopaque, usually strongly sculptured black or dark brown ants. Workers monomorphic. Head subrectangular, with the eyes usually well developed, rarely vestigial, placed at or in front of the posterior third of the head. Mandibles subtriangular, with coarsely dentate apical margin. Cheeks without a carina. Clypeus with rounded, obtusely angular or feebly

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[1] 1915, Ann. Ent. Soc. America, VIII, pp. 333–337.

[2] 1917, Trans. Ent. Soc. London, (1916) Proc., p. cxxix.

and sinuately marginate anterior border, prolonged backward as a narrow point between the frontal carinæ, which are broadly and lobularly expanded, incrassated and covering the insertions of the antennæ. Frontal groove distinct. Antennæ stout, 12-jointed. Thorax with distinct promesonotal suture, but with the mesoepinotal suture and that between the mesosternum and mesepisternum absent or obsolescent. Pronotum not marginate on the sides; epinotum usually unarmed. Petiole with a thick, more or less transverse node, in a few species somewhat compressed and dentate above or behind. Gaster subcylindrical, with pronounced constriction between the postpetiole and succeeding segment, the postpetiole truncated in front; sting rather short and blunt. Middle and hind tibiæ each with a large pectinated and a simple lateral spur; claws simple.

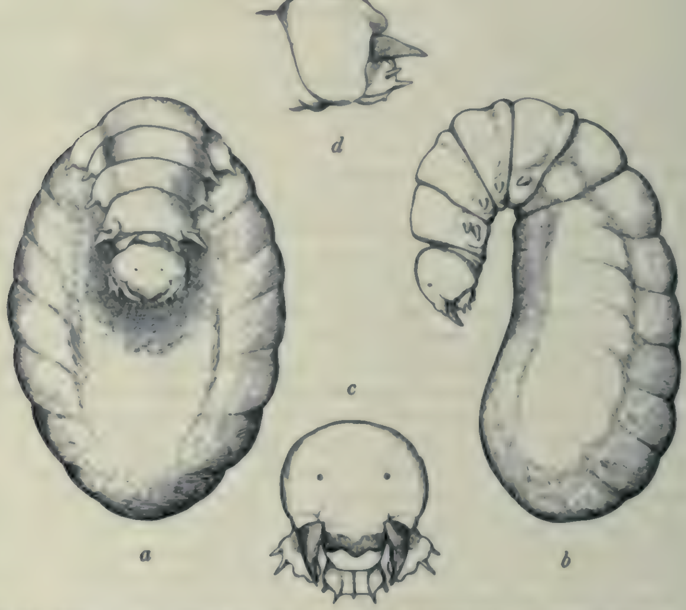
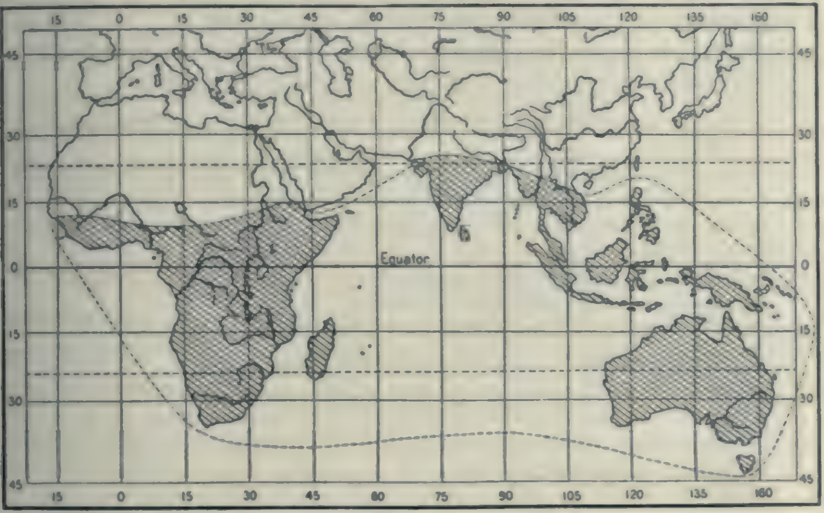


Fig. 9. *Bothroponera sublævis* Emery. Australia. Adult larva. *a*, ventral view; *b*, lateral view; *c*, head, dorsal view; *d*, head in profile.

Female only slightly larger than the worker; winged; in other respects very similar to the worker; ocelli small; pronotum broad and exposed; mesonotum small, flattened, broader than long. Wings rather broad; with a discoidal cell, two cubital cells and a closed radial cell.

Male nearly the same size as the worker. Head short, rounded behind; eyes and ocelli very large; mandibles small, flat, edentate. Palpi long, the labial pair 3-jointed, the maxillary pair 5-jointed. Frontal carinæ short. Antennæ very long, filiform, 13-jointed; the scape short, scarcely twice as long as broad; the first funicular joint not longer than broad, the remaining joints long and cylindrical. Pronotum transverse, truncated in front; mesonotum without Mayrian furrows; scutellum very convex. Abdomen strongly constricted behind the postpetiole; pygidium terminating in a downwardly directed spine. In some species the penultimate sternite of the gaster is notched and prolonged on each side as a prominent lobe. Genitalia retracted.

Mayr described *Bothroponera* as a genus; but Emery, Forel, and Santschi have been treating it as a subgenus of *Pachycondyla*. I return to Mayr's conception for the following reasons: First, the larvæ of *Bothroponera* (Fig. 9*a–d*) are quite different from those of *Pachycondyla*, as I have shown in a former paper.[1] Second, *Bothroponera*, being a strictly paleotropical group may be advantageously separated as a distinct genus from the purely neotropical *Pachycondyla*. *Ectomomyrmex* may be regarded either as a subgenus of *Bothroponera* or as an independent genus. I prefer to adopt the latter course. I also separate out a small group of species of *Bothroponera* (*gabonensis* Ern. André and *sveni* Forel) as a distinct genus *Phrynoponera* (*vide infra*). Third, there are certain peculiarities in the habits of *Bothroponera* which indicate that the species are generically distinct. Like *Pachycondyla*, they form small colonies under stones in rather moist, clayey soil, but are more sluggish and do not sting readily when captured and instead emit from the posterior end of the body a peculiar mass of frothy substance. I have observed this in some of the Australian species, and Bingham and Taylor have seen similar behavior in the Indian *B. rufipes* (Jerdon), according to Wrought-



Map 10. Distribution of the genus *Bothroponera*.

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[1] 1918, 'A study of some ant larvæ, etc.' Proc. Amer. Phil. Soc., LVII, p. 299.

on.[1] Bingham says that this ant "blows a whitish, acrid smelling, rather gelatinous froth when seized" and according to Taylor it exudes when seized "a milky substance of a frothy nature which hardens on exposure to the air and resembles fine cotton; it is called 'domona chunti' or 'gendu,' the 'domonas' being the weaver caste in Orissa." *B. tridentata* (F. Smith) of Borneo seems to have the same habit, according to Beccari.[2]

The genus *Bothroponera* is widely distributed over the Ethiopian, Indomalayan, Papuan, and Australian Regions (Map 10). Africa is very rich in species but Australia possesses almost as many.

The following table may be of some assistance in identifying the workers and females of the Ethiopian species of *Bothroponera*.

1. Head, thorax, petiole and postpetiole coarsely punctate, punctate-rugulose or striated.......................2.
   These regions finely and densely punctate, sometimes with superimposed, larger but shallow punctures.......................9.
2. **Mandibles striate**.......................3.
   Mandibles smooth, sparsely punctate.......................7.
3. Petiolar node broadly excised posteriorly.......................*cariosa* Emery.
   Petiolar node sharply truncated posteriorly.......................4.
4. Length 8 mm.; testaceous yellow.......................*cribrata* (Santschi).
   Length not less than 9 mm.; black or brownish black.......................5.
5. Antennal scapes reaching to occiput.......................*cavernosa* (Roger).
   Antennal scapes not reaching to occiput; eyes small.......................6.
6. Length 9 mm.; golden pubescence on body, especially on head, abundant; sculpture less pronounced.......................*talpa* Ern. André.
   Length 12 to 15 mm.; golden pubescence less pronounced; sculpture coarser. ***pachyderma* (Emery).**
7. Petiolar node broadly excised posteriorly; body covered with golden pubescence. ***granosa* (Roger).**
   Petiolar node truncated behind; body without golden pubescence.......................8.
8. Gaster opaque, finely striated.......................*strigulosa* Emery.
   Gaster more or less shining.......................*pumicosa* (Roger).
9. **Eyes well developed in the workers**.......................10.
   Eyes vestigial in the workers.......................15.
10. Length 5.5 mm.......................11.
    Length at least 7 mm.......................12.
11. Mandibles 7-toothed; petiole as long as broad.......................*picardi* (Forel).
    Mandibles 6-toothed; petiole nearly twice as broad as long.......................*silvestrii* (Santschi).
12. Mandibles shining, sparsely punctate.......................*soror* (Emery).
    Mandibles finely striate.......................13.
13. Opaque; head ovoid.......................*krügeri* (Forel).
    Subopaque or shining; head subrectangular.......................14.

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[1] 1891, 'Our Ants.' Journ. Bombay Nat. Hist. Soc., VII, p. 54.

[2] 'Nelle foreste di Borneo.' Firenze, 1902, p. 237; *teste* Emery, 1911, 'Genera Insectorum, Ponerinæ,' p. 75.

14. Very shining; length 12 mm.; clypeus angularly produced in middle; eyes small.......................................*lævissima* (Arnold).
Subopaque; length 7 to 7.5 mm.; clypeus feebly sinuate in middle; eyes larger. *crassa* Emery.

15. Length only 4.5 to 5.5 mm.; mandibles smooth, sparsely punctate; eyes very small, with less than a dozen facets..................*sjöstedti* (Mayr).
Length 6.5 to 7 mm.; mandibles striate at the tip; eyes larger, with about 45 facets.......................................*fugax* (Forel).

Bothroponera pachyderma (Emery)

Manamana, ☿; Bafwasende, ☿; Medje, ☿; Ngayu, ☿; Niapu, ☿, ♀; Niangara, ☿; Akenge, ☿, ♀ (Lang and Chapin). The specimens from Manamana, fourteen in number, are accompanied by the note: "Found under a log. When it was lifted the ants feigned death." The specimen from Bafwasende is very small. The specimens from the other localities, seventy-four in number, were all taken from the stomachs of toads (*Bufo polycercus*, *superciliaris*, *funereus*, and *tuberosus*). One specimen from Akenge was taken from the stomach of a frog (*Rana albolabris*).

I believe I have identified this species correctly. All the specimens, both workers and females, have a blood-red, subtriangular spot at the middle of the posterior border of each gastric segment. I regard Santschi's *B. sculpturata*, described from a female, as synonymous with Emery's *pachyderma*.

Bothroponera pachyderma variety **funerea,** new variety

FEMALE (deälated).—

Length more than 13 mm.

Differing from the typical form in its somewhat greater size and in color, being coal black, with only a slight brownish tinge to the legs. Even the frontal carinæ and antennæ are black and there is no red on the gastric segments. The erect hairs on the dorsal surface are also black, at least in certain lights, not fulvous as in the typical form, but the hairs and pubescence on the tibiæ and tarsi are of the latter color. The foveolæ on the gastric segments, especially behind the anterior portion of the first segment, seem to be shallower and both they and the spaces between them to be less distinctly striated than in the typical *pachyderma*.

A single specimen from Medje (Lang and Chapin) taken from the stomach of a toad (*Bufo polycercus*).

Bothroponera talpa Ern. André

Niapu, ☿; Niangara, ☿; Avakubi, ☿; Medje, ☿, ♀ (Lang and Chapin). Eight specimens, all taken from the stomachs of toads (*Bufo funereus*, *polycercus*, and *superciliaris*) and agreeing well with André's description.

Bothroponera soror (Emery)

Akenge, ☿, ♀; Medje, ☿, ♀; Ngayu, ☿; Niangara, ☿; Avakubi, ☿; Niapu, ☿; Faradje, ☿ (Lang and Chapin). Forty-one workers and three deälated females. All but three of these specimens were taken from the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, *tuberosus*, and *regularis*); one from Faradje was taken from the stomach of a frog (*Rana occipitalis*). Arnold records this as a rather rare species in Rhodesia. "It usually nests under stones, and has a very strong smell of cockroaches. The colonies do not usually comprise more than two dozen individuals." Two of the specimens from Medje were taken by Mr. Lang while they were crawling on tree trunks and also on the tents of the expedition. He notes that, "when crushed, they gave off a stench reminding one of a bug."

Bothroponera soror variety **ancilla** (Emery)

A single worker from Isangi (Lang and Chapin) differs from the typical *soror* in its smaller size (less than 7 mm.). It differs from Emery's description of the variety *ancilla*, however, and agrees with the typical form in having a trace of the mesoëpinotal suture.

Bothroponera sjöstedti (Mayr)

Text Figure 10

Eight workers taken by Dr. Bequaert at Malela agree very closely with Mayr's description of the types from Cameroon except in being smaller. They were nesting "under the fallen trunk of a palm in swampy ground." The type specimens were found by Sjöstedt "in a rotten palm trunk," according to Mayr. The species is peculiar in its very small size, pale coloration and in having the eyes reduced to a few ommatidia.

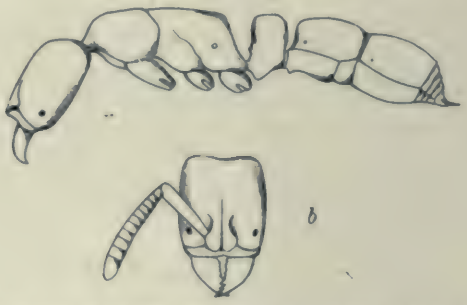


Fig. 10. *Bothroponera sjöstedti* (Mayr). Worker. *a*, lateral view of body; *b*, head from above.

Phrynoponera Wm. M. Wheeler

Worker.—Allied to *Bothroponera* but distinguished by the following characters: body shorter and stouter; mandibles narrower, not triangular, their basal and external borders parallel, the apical border oblique, bluntly dentate, not forming a distinct angle with the basal border. Clypeus short, elevated in the middle, with a median furrow and a ridge on each side, the anterior border broadly rounded and entire or bluntly bidentate, posteriorly extending back between the frontal carinæ as a narrow acute point. Frontal carinæ expanded as lobes but the latter are not thickened as in *Bothroponera*, but depressed except at the edges which are smooth and slightly elevated, concealing the insertions of the antennæ as in *Bothroponera*. Eyes rather large and convex, broadly elliptical, placed just in front of the middle of the head. Antennæ stout, 12-jointed as in most Ponerinæ. Thorax with broad pronotum; promesonotal suture distinct, arcuate; mesoëpinotal and mesepisternal sutures obsolete. Epinotum with two stout spines. Petiole surmounted by a flattened scale which curves back over the postpetiole and terminates in a comb consisting of five acute, flattened teeth. Remainder of abdomen very short, oval, the postpetiole which forms nearly half of it, not truncated but rounded in front and not separated by a constriction from the first gastric segment, though the stridulatory surface is well developed as in *Bothroponera*. Sting very long; longer, more slender and more acute than in the latter genus. Legs rather long and stout; middle and hind tibiæ each with a long pectinated and a simple lateral spur; claws simple. Sculpture of body coarse; pilosity short, abundant, coarse and erect.

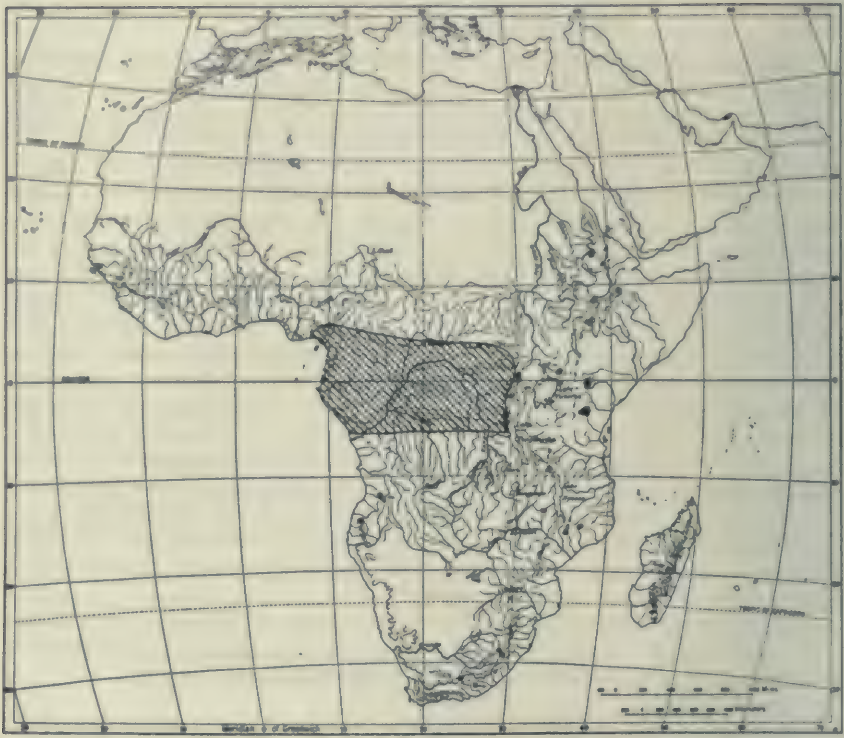
Female winged, but wings unknown; in other respects very similar to the worker and scarcely larger. Ocelli small. Pronotum broad and exposed; mesonotum and scutellum flat, together nearly circular, each being broader than long.

Male unknown.

Genotype: *Bothroponera gabonensis* Ern. André.

In my opinion this is a very distinct genus and would probably long since have been recognized as such had it not been that only one or two species were known and these very imperfectly, that one species of *Bothroponera* [*B. bispinosa* (Smith) of India] has a spined epinotum, and that another Indian species [*B. rufipes* (Jerdon)] has the petiole anteroposteriorly compressed above and the border denticulate, thus suggesting the conditions in *Phrynoponera*. In reality the latter genus is distinct, not only in the structure of the petiole but also of the mandibles, frontal carinæ, and postpetiole, in the absence of any constriction between the postpetiole and the gaster, and in the abbreviation of the latter. The genus seems to be confined to a narrow region in West-Central Africa (Map 11). The species probably all live in the humus of the rain forest. The workers and females of the forms which I have seen from the Congo may be separated with the aid of the following dichotomy.

1. **Clypeus with two large blunt teeth..................................2.**
 Clypeus without teeth..................................7.
2. Length 6.5 to 7.5 mm.; mandibles 4-toothed..................................3.
 Length 9 mm.; mandibles 7-toothed .... *heterodus*, new species.



Map 11. Distribution of the genus *Phrynoponera*.

3. Gaster shining, feebly sculptured (*gabonensis*)..............................4.
Gaster opaque or subopaque, strongly sculptured..........................5.
4. Mandibles, frontal carinæ, antennæ and legs red. . typical *gabonensis* (E. André).
Mandibles, frontal carinæ, antennæ and legs blackish. . . . . var. *esta*, new variety.
5. Mandibles smooth, sparsely punctate...................................6.
Mandibles striated and sparsely punctate. . . . . var. *striatidens* (Santschi).
6. Mandibles, frontal carinæ, antennæ and legs red. . . . var. *fecunda*, new variety.
Mandibles, frontal carinæ, antennæ and legs blackish. . var. *umbrosa*, new variety.
7. Small species (6 mm.); funicular joints 2 to 10 much broader than long; mandibles and appendages black. . . . . *bequaerti*, new species.
Large species (8 to 9 mm.); funicular joints 2 to 5 at least as long as broad; 6 to 10 slightly broader than long; mandibles and appendages red.
sveni (Forel).

Phrynoponera gabonensis (Ern. André)

There are specimens of five different forms of this species in the collection. To *gabonensis*, *sensu stricto*, I refer a single worker from Bafwasende, one from Medje (from the stomach of a toad, *Bufo funereus*), and two workers and a deälated female from Akenge (from the stomachs of *B. polycercus* and *funereus*). In these specimens (Fig. 11*a*-*c*) the antennal scapes extend somewhat beyond the posterior border of the head; the first funicular joint is as long as broad and distinctly longer than the second; joints 2 to 10 distinctly broader than long; the terminal joint pointed but not flattened. The lateral petiolar spines are nearly twice as long as the three others, the median but little longer than the intermediate pair. The gaster is distinctly shining, and the mandibles, front of head, frontal carinæ, legs, and posterior borders of gastric segments red, as André states. The mandibles are shining and coarsely punctate, without striæ. The postpetiole has in some specimens a distinct opalescent blue reflection not mentioned by André. The specimens measure 6.5 to 7.5 mm. The female has the pronotum indistinctly and semicircularly, the mesonotum and scutellum longitudinally rugose.

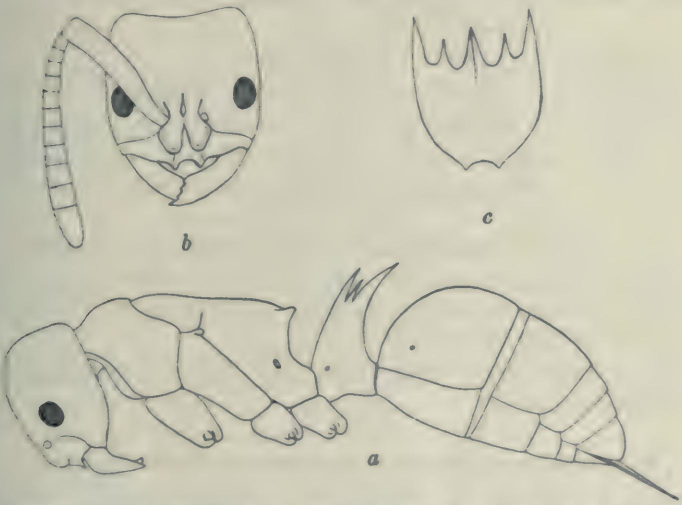


Fig. 11. *Phrynoponera gabonensis* (Ern. André). Worker. *a*, lateral view of body; *b*, head from above; *c*, petiole, dorsal view.

Phrynoponera gabonensis variety **esta,** new variety

Worker and Female (deälated).—Differing from the preceding form in color, the mandibles being nearly black, the frontal carinæ, antennæ and legs blackish brown, very nearly as dark as the remainder of the body, the posterior borders of the abdominal segments slightly paler and more reddish. The mandibles and gaster are shining as in the typical form.

Described from eight workers and a female from Medje (type locality), two workers from Ngayu, and a female from Gamangui (Lang and Chapin), all found in the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, and *tuberosus*).

Phrynoponera gabonensis variety **fecunda,** new variety

Worker and Female (deälated).—Having the coloration of the typical form, i. e., with the mandibles, frontal carinæ, antennæ, legs, and posterior borders of the abdominal segments red, but with the postpetiole and gaster opaque, densely and finely punctate, and with superadded coarser longitudinal punctures, or aciculations, having sharp anterior edges. The legs are somewhat more opaque and more coarsely coriaceous than in the typical *gabonensis*. The mandibles are shining and sparsely and coarsely punctate, as in the two preceding forms.

Described from eleven workers and one female from Akenge (type locality), eighteen workers from Medje, two from Ngayu, and one from Avakubi (Lang and Chapin). All the specimens were found in the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, and *tuberosus*).

Phrynoponera gabonensis variety **umbrosa,** new variety

Worker.—Coloration like that of the variety *esta*, black throughout, the postpetiole and gastric segments with narrow brown posterior border. The sculpture of the gaster is that of the variety *fecunda*.

Two specimens from Medje (Lang and Chapin) from the stomach of a toad (*Bufo polycercus*).

Phrynoponera gabonensis variety **striatidens** (Santschi)

Medje, ☿; Akenge, ☿; Ngayu, ☿ (Lang and Chapin). Four specimens, all from the stomachs of toads (*Bufo polycercus*, *funereus*, and *tuberosus*). These specimens have the coloration of the typical *gabonensis* and variety *fecunda* and the abdominal sculpture of the latter, but the mandibles are subopaque and finely striated, except at the base, in addition to having the coarse, sparse punctures of the other varieties. The epinotal spines seem to be a little longer and more acute than in any of these forms.

Phrynoponera heterodus, new species

Female (deälated).—

Length 9 mm.

Very closely related to *gabonensis* but differing in its larger size and in the following particulars: the apical borders of the mandibles are 7-toothed and, in addition to the coarse punctures, are finely striated on their apical halves. The antennæ are somewhat longer, the funicular joints 2 to 7 being as long as broad. The rugæ on the front and vertex are distinctly coarser and more divergent, the eyes somewhat smaller, the posterior corners of the head more acute, the clypeus bluntly bidentate as in *gabonensis*. The sculpture of the thorax and petiole is also very similar, the postpetiole and gaster sculptured as in the variety *striatidens* but even more sharply, so that the whole surface is opaque. The epinotal spines are broad and flat as in *gabonensis* but the median petiolar tooth is nearly twice as long as the intermediate teeth. The pilosity is, if anything, a little more abundant than in *gabonensis* and its varieties. The color is black, with the mandibles, legs, and posterior borders of the abdominal segments dark castaneous brown.

A single specimen from Stanleyville (Lang and Chapin), without further data. This form might be regarded as a large subspecies of *gabonensis* but its precise status can hardly be determined without worker specimens.

Phrynoponera bequaerti, new species

Text Figure 12

FEMALE (deälated).—

Length 6 mm.

Resembling *gabonensis* and *heterodus* but much smaller. Head, excluding the mandibles, fully as broad as long, the posterior border nearly straight; the sides very feebly and evenly convex; the eyes large, moderately convex, with their posterior orbits at the middle of the sides. Mandibles shaped as in *gabonensis*, with obliquely, bluntly 4-toothed apical borders. Clypeus short, with broadly rounded, entire anterior border, the elevated central portion somewhat concave behind in the middle, with a ridge on each side. Antennæ short and thick, the scapes scarcely extending beyond the posterior border of the head; first funicular joint nearly as long as broad, remaining joints, except the last, decidedly broader than long. Thorax as broad as the head, short, shaped much as in *gabonensis* but the epinotal teeth are proportionally longer, being longer than broad at their bases and as long as the distance between the latter, flattened dorsoventrally, with round lobe-like tips. Petiole with longer spines than in *gabonensis*, the lateral spines being as long as the remainder of the segment and the median spine as long as the lateral.

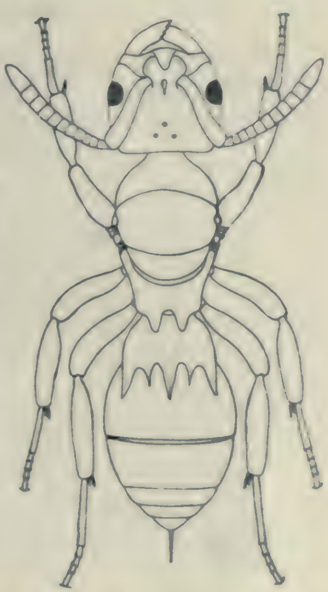


Fig 12. *Phrynoponera bequaerti*, new species. Deälated female.

Mandibles smooth and shining with very coarse, sparse punctures, most numerous near the inner border. Remainder of body subopaque except the borders of the frontal carinæ which are smooth and shining. Head reticulate-rugose, rather coarsely on the sides, on the front and vertex more finely, the rugæ scarcely longitudinal. Thorax covered with coarse umbilicate foveolæ, which are largest on the mesonotum but everywhere so close together that the surface may be described as reticulate-rugose. Anterior surface of petiole with similar sculpture, but the meshes of the reticulum elongate. Postpetiole and gaster appearing longitudinally striate owing to their having a sculpture like that of *P. heterodus* and several of the varieties of *gabonensis*. Legs and antennal scapes nearly opaque, closely coriaceous.

Pilosity and pubescence much as in *gabonensis* and *heterodus* but the former more reclinate on the head, thorax, and abdomen.

Black; mandibles, frontal carinæ, and legs dark brown.

Described from a single specimen taken from the stomach of a toad (*Bufo superciliaris*) from Ngayu (Lang and Chapin) This is a very distinct species, easily characterized by its small size, edentate clypeus, long median petiolar spine and peculiar cephalic and thoracic sculpture.

Phrynoponera sveni (Forel)

Three workers from Medje (Lang and Chapin), agree perfectly with Forel's description. They all show, however, a beautiful blue opalescence, like that of *Lobopelta iridescens*, on the smooth declivity of the epinotum, the sides of the petiole, and the whole surface of the postpetiole. This may have been overlooked by Forel, as the surfaces of these ants are often covered with a layer of dirt. It was only after my specimens had been thoroughly washed in caustic potash that the blue coloration of the parts above mentioned was revealed. *P. sveni* is a strongly marked species, characterized by the long antennæ, toothless clypeus, and slender, pointed and upwardly directed epinotal spines (Fig. 13*a*–*c*).

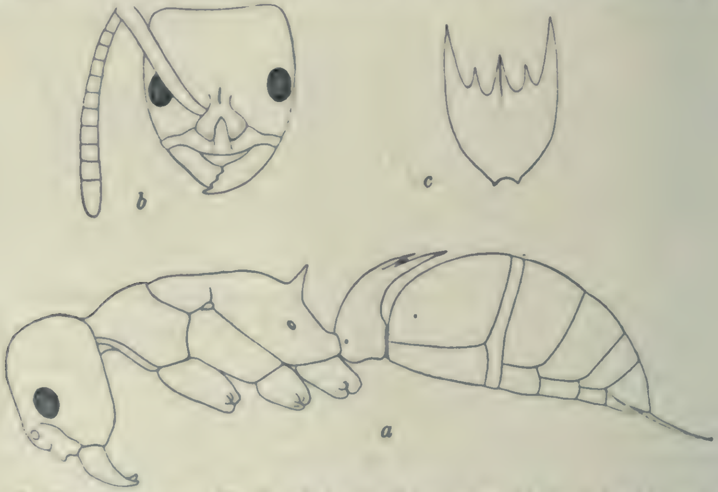


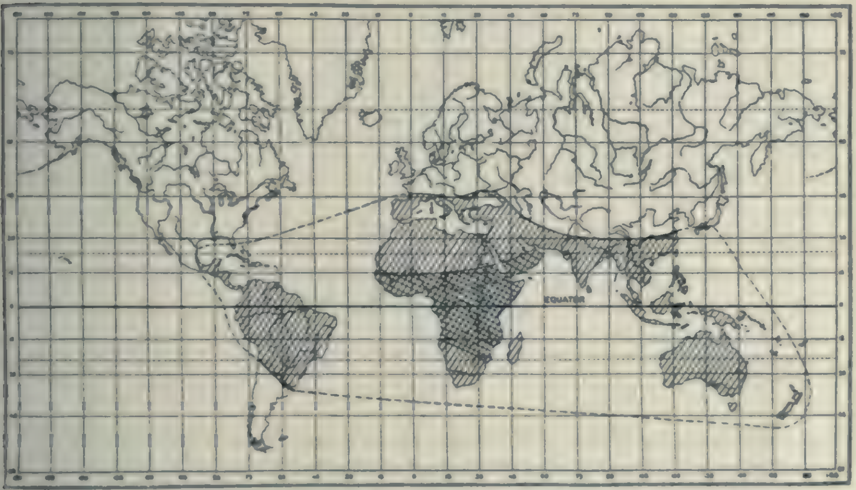
Fig. 13. *Phrynoponera sveni* (Forel). Worker. *a*, lateral view of body; *b*, head from above; *c*, petiole, dorsal view.

EUPONERA Forel

Resembling *Bothroponera* but smaller and much more finely sculptured.

WORKER monomorphic, with subtriangular mandibles the apical margins of which are dentate. Cheeks not carinate. Frontal carinæ closely approximated, expanded and lobular in front and concealing the insertions of the antennæ. Eyes placed near or in front of the anterior third of the head, sometimes vestigial or even absent. Clypeus rounded and obtusely pointed in front, usually carinate. Antennæ slender, 12-jointed, the scapes slightly thickened apically but not clavate. Thorax shaped somewhat as in *Bothroponera* but with distinct mesoëpinotal suture and usually with distinct mesoëpinotal constriction. Petiole surmounted by a thick transverse scale. Middle and hind tibiæ with two spurs; claws simple.

FEMALE winged; in some of the subgenera scarcely larger, in one (*Brachyponera*) considerably larger than the worker; in other respects similar.



Map 12. Distribution of the genus *Euponera* (simple crossing) and of *Euponera* (*Brachyponera*) *sennaarensis* (Mayr) (double crossing).

MALE much like the males of *Pachycondyla* and *Bothroponera* but differing somewhat in the various subgenera.

Emery has divided this genus into four subgenera: *Euponera*, *sensu stricto*; *Mesoponera*; *Brachyponera*; and *Trachymesopus*. *Euponera*, with a single species, is confined to Madagascar; the other subgenera have a wide distribution over the tropical and subtropical portions of both hemispheres (Map 12). The species live in the ground, either in crater nests or under stones, logs, etc. *Eu.* (*Mesoponera*) *castanea* (Mayr) of New Zealand lives, as a rule, in rotten logs and stumps. The colonies of *Brachyponera* are rather large and populous, those of the other subgenera much smaller. In the subgenus *Trachymesopus* there is a pronounced tendency to hypogæic habits and also, therefore, to a degeneration of the eyes in the worker.

Euponera (Mesoponera) ingesta, new species

Text Figure 14

WORKER.—

Length 5.5 to 6 mm.

Head somewhat longer than broad and about as broad in front as behind, with evenly convex sides and feebly excavated posterior border. Eyes small, flat, broadly elliptical, placed at the anterior fifth of the sides of the head. Clypeus carinate, its anterior border entire, rounded and projecting in the middle, sinuate at the sides. Mandibles moderately long, convex, their apical borders with 8 or 9 subequal teeth. Antennal scapes extending slightly beyond the posterior border of the head; first and second funicular joints subequal, about one and one-half times as long as broad, joints 4 to 6 somewhat shorter, remaining joints, except the last, as broad as long. Pronotum as long as broad, somewhat depressed above and very bluntly submarginate on the sides. Mesonotum convex, transversely elliptical, nearly twice as broad as long, completely surrounded by a strong suture; mesoëpinotal constriction distinct. Epinotum nearly as long as the pro- and mesonotum together, but somewhat lower, the base and declivity straight, subequal, forming an obtuse angle with each other, the former horizontal in profile, the latter flat; marginate on the sides. Petiolar scale in profile high and cuneate, its anterior surface feebly convex from side to side, its posterior surface flat, with a shallow longitudinal impression in the middle; the border evenly rounded, semicircular from behind, slightly narrowed ventrally. Gaster short, postpetiole sharply truncated in front, the constriction between it and the gaster feeble. Legs moderately long.

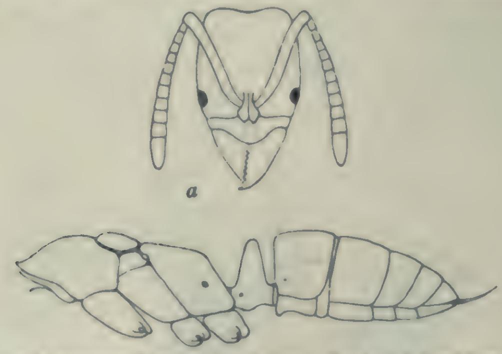


Fig. 14. *Euponera (Mesoponera) ingesta*, new species. Worker. *a*, head from above; *b*, thorax and abdomen in profile.

Mandibles shining, finely and rather indistinctly punctate; remainder of body subopaque; clypeal carina and legs more shining; very finely and densely punctate, especially the head, scapes and thorax.

Hairs almost lacking on the head, thorax, and appendages; on the gaster pale yellow, sparse, erect, slender, and rather uniformly distributed; pubescence very fine, yellowish, moderately abundant, investing the whole body, including the appendages.

Castaneous; legs somewhat paler; mandibles deep red, with black teeth; in some specimens the extensor surfaces of the tibiæ are yellowish.

Described from six specimens taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (type locality), one from Niapu, also from a toad's stomach (*B. polycercus*), a single specimen from Faradje, and another from Lubila (Lang and Chapin).

Euponera (**Mesoponera**) **subiridescens,** new species

Text Figure 15

WORKER.—

Length 6.5 to 7 mm.

Head longer than broad, as broad in front as behind, with feebly and broadly excised posterior border and feebly convex sides. Eyes rather large, feebly convex, placed with their posterior orbits just in front of the middle of the sides. Mandibles very long, narrow, with feebly concave external borders, the apical border very long, toothless except at the tip where there are four small, blunt, oblique teeth. Clypeus carinate, its anterior border broadly projecting, sinuate on each side of the middle and also more deeply at each mandibular insertion. Frontal carinæ short, their upper surfaces rather concave. Antennæ slender, the scapes extending beyond the posterior border of the head a distance nearly equal to twice their greatest diameter; funicular joints 1 and 2 subequal, almost twice as long as broad; joints 3 to 5 somewhat shorter; remaining joints, except the last, little, if at all longer than broad. Pronotum rather convex and rounded, as long as broad; mesonotum transverse, semicircular, surrounded by an impressed suture. Mesoëpinotal constriction distinct. Epinotum as long as the pro- and mesonotum together, the base rounded and convex, somewhat

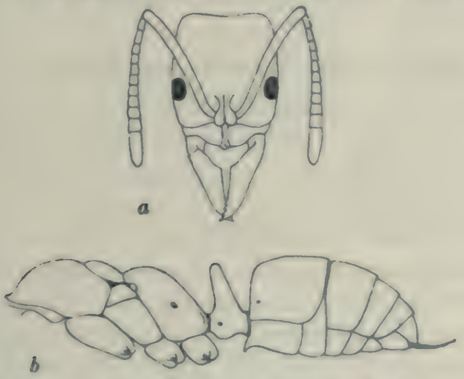


Fig. 15 *Euponera* (*Mesoponera*) *subiridescens*, new species. Worker. *a*, head from above; *b*, thorax and abdomen in profile.

lower than the mesonotum, passing gradually into the somewhat longer, sloping declivity, which is flat, bluntly marginate on the sides. Petiolar scale shaped as in *ingesta*, but not so thick, with the anterior surface more flattened and the posterior not impressed in the middle. Gaster short and stout, convex above, the postpetiole truncated in front, the constriction between it and the succeeding segment very feeble. Legs moderately long.

Shining; mandibles more so than the remainder of the body, smooth, with only a few large punctures along the apical margin. Remainder of body very finely but not deeply punctate and less densely than in *ingesta*.

Hairs lacking, except on the mandibles, clypeus, pygidium, and hypopygium, where they are pale yellow and rather long; the pubescence, too, is yellowish and rather long and abundant on the body and appendages, longest on the gaster.

Deep castaneous, almost black; the head and thorax with a more or less distinct blue iridescence as in some species of *Lobopelta* (*iridescens*, *chinensis*); inner borders of mandibles, the legs, antennæ, and tip of gaster somewhat paler and more reddish.

Described from six specimens, all from the stomachs of toads; four from Akenge (type locality) from the stomach of *Bufo polycercus*, one from Medje from the stomach of *B. superciliaris*, and one from Ngayu from the stomach of *B. tuberosus* (Lang and Chapin).

Both this and the preceding species seem to be very distinct from any of the previously described African species of *Mesoponera*.

Euponera (**Brachyponera**) **sennaarensis** (Mayr)

Thysville, ☿, ♂, ♀ (Lang and Bequaert); Avakubi, ☿; Leopoldville, ☿, ♂; Faradje, ☿, ♂; Medje, ☿; Zambi, ♂; Stanleyville ♀, ♂; Niapu, ☿ (Lang and Chapin). One of the specimens from Medje was taken from the stomach of a toad (*Bufo funereus*).

This is a well-known ant which seems to be common throughout a large part of the Ethiopian Region and even ranges into Asia (Arabia). Concerning its habits Arnold writes that it is "the commonest ponerine ant around Bulawayo (Rhodesia). A crateriform mound of fine earth surrounds the entrance to the nest, which is as often situated in the open as it is under stones. The economic value of this little species can hardly be overestimated, since it is exceedingly plentiful and preys unceasingly on termites. It is, however, omnivorous, since it will eagerly collect bread-crumbs, insects of all sorts, and seeds of grass. Heaps of the latter are often found in the nests." Escherich, in Abyssinia, and Bequaert, in the Katanga, had previously noted its fondness for collecting grass seeds, a very unusual habit in the Ponerinæ.

The following note by Mr. Lang accompanies the specimens from Avakubi: "I have generally seen this ant, which the natives call 'tussisomee,' singly or two or three together, running swiftly over the sandy ground, from which they throw up tiny craters about one inch wide and two-thirds of an inch high. These consist of excavated particles of ground loosely put together. From the crater slender channels, two to three millimeters wide, run laterally or vertically into the hard soil. When a knife is stuck into the ground near the crater, one or even three ants may be seen hurrying away. I never saw any of the larvæ. The craters are often quite numerous. Today I counted about 60 over an area of 500 square yards. The natives say that these ants bite (sting?) and fear them even more than the 'siafu' (army ants), though they never occur in masses. They build their craters in cleared ground, chiefly after rainy nights, and are seldom seen during the day time." These accounts indicate that the habits of *sennaarensis* are very similar to those of the Australian *E.* (*B.*) *lutea*, which I have studied in New South Wales and Queensland. The latter species, however, prefers to nest under stones and logs and is, if anything, even more abundant than its African cousin.

Euponera (**Trachymesopus**) **darwini** (Forel) variety **africana** Forel

A single deälated female from Stanleyville (Lang and Chapin). This species has an extraordinary range, from Northern Australia and the Philippines through India to Nigeria. It is very probably hypogæic in habit as the worker of most of the varieties, including the African, is still unknown.

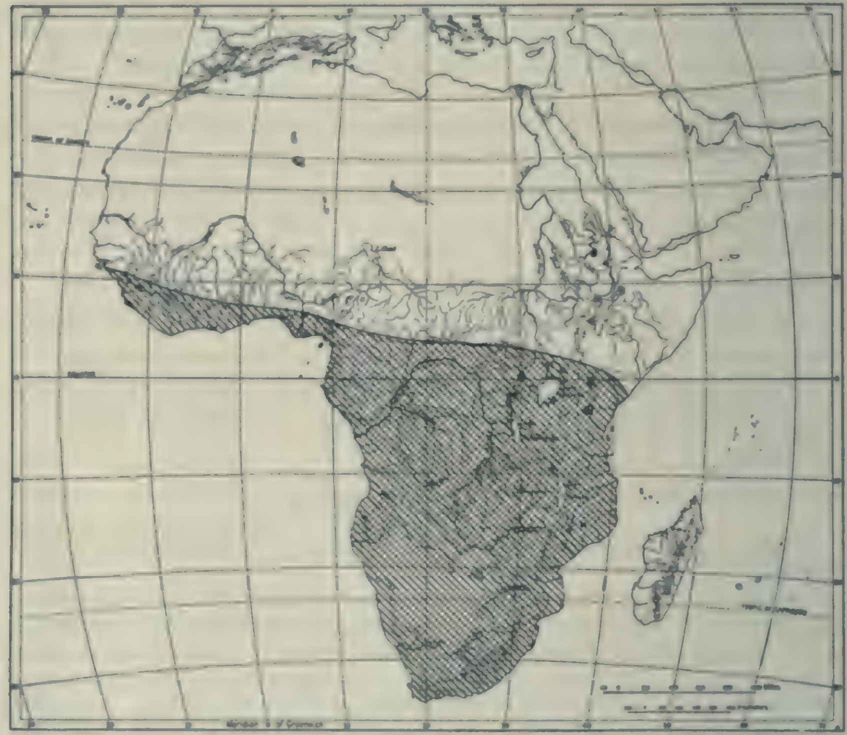
PLECTROCTENA F. Smith

Large or medium-sized black or castaneous ants, with shining surface, sparsely punctate.

WORKER monomorphic, with large, rectangular and rather flat head, with small, flat, anteriorly situated eyes. Clypeus very short, its anterior border straight in the middle, emarginate on each side at the mandibular insertion, apparently not extending back between the frontal carinæ, the latter overhanging the clypeus and forming with the front an elevated lobe, longitudinally sulcate in the middle. Mandibles long, linear, feebly curved, with a deep narrow furrow running nearly their full length on the dorsal surface, their tips blunt, the inner margin armed with a strong tooth at the basal third and another obtuse tooth, sometimes indistinct, between the latter and the tip. Antennæ 12-jointed, the funiculi somewhat thickened towards their tips, the first joint shorter than the second. Thorax large and depressed, promesonotal suture distinct, mesoëpinotal suture obsolete, epinotal declivity marginate on the sides. Petiole with a laterally compressed node, with the anterior and posterior surfaces vertical in profile, the dorsal surface horizontal. Constriction between the postpetiole and gaster pronounced, with well-developed stridulatory surface. Gaster short, formed largely by the first segment. Median spurs of middle and hind tibiæ large and pectinated, lateral spurs lacking.

Female winged, apterous or ergatomorphic, larger than the worker but otherwise similar. Eyes and ocelli small. Anterior wings with a discoidal cell, two cubital cells and the radial cell closed.

Male about the size of the worker. Frontal carinæ short, erect, closely approximated, bringing the insertions of the antennæ close together. Antennal funiculi filiform, their first joint very short; scapes stout, shorter than the second funicular joint. Mandibles small, linear, parallel-sided, edentate, with rounded tips. Mesonotum with distinct Mayrian furrows; scutellum longitudinally grooved in the middle. Genitalia retracted; pygidium terminating in a blunt or truncated point. Wings short.



Map 13. Distribution of the genus *Plectroctena*.

This singular genus is confined to the Ethiopian Region (Map 13). Arnold has observed the habits of the type species, *P. mandibularis*, in South Africa. "The entrances to the nest are generally indicated by large heaps of earth. The chambers are placed deep below the surface, seldom less than 2 feet, and the number of individuals seldom exceeds 50. It is a sluggish and timid ant, the workers foraging singly. The food includes termites, but consists chiefly of millipeds and beetles." Another

South African species described by Arnold as *P. subterranea* is castaneous red, measures only 7.5 to 10 mm., and has exceedingly small eyes. It, in all probability, belongs to a different genus. In the generic key it runs down to *Myopias* and is provisionally referred to that genus.

The character of the females in the four described species of *Plectroctena* has not been adequately ascertained. Winged females of *P. minor* and *subterranea* are known, but no winged females of *mandibularis*. According to Arnold, this species has ergatoid females differing "from the worker chiefly in size, but the head and abdomen are proportionally wider and longer. The longitudinal impression on the pronotum is shallower, while that of the dorsum of the epinotum is deeper and wider. In a nest of three dozen or so individuals, not more than two or three of these forms are to be found, and usually only one." It seems that Forel saw one of these ergatoid females and described it as a subspecies (*major*) of *mandibularis*. There is, however, still another type of female, at least in *P. minor*, of which I describe a specimen below, with ocelli and slightly larger eyes than the worker and with the thorax essentially like that of the winged female, but without the slightest indications of ever having borne wings.

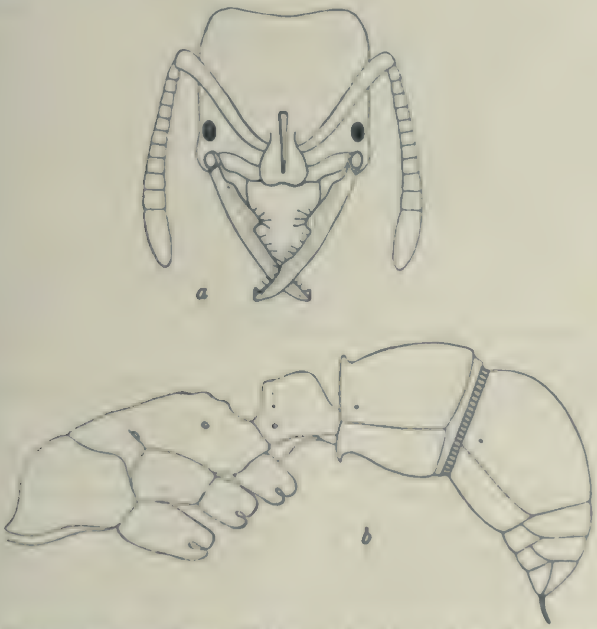


Fig. 16. *Plectroctena cristata* Emery. Worker. *a*, head from above. *b*, thorax and abdomen in profile.

Plectroctena cristata Emery

Text Figure 16

Medje, ☿; Akenge, ☿ (Lang and Chapin). Eight specimens, all taken from the stomachs of toads (*Bufo superciliaris*, *polycercus*, and *funereus*).

Plectroctena minor Emery

A single apterous female from Akenge from the stomach of a toad (*Bufo polycercus*); a single worker from Niapu from the stomach of a frog (*Xenopus tropicalis*); Stanleyville, ☿, ♀, ♂ (Lang and Chapin).

Female (apterous).—

Length about 12 mm.

Smaller than the winged female and with slightly smaller eyes. Ocelli present. The thorax of the same shape as in the winged female but without wing insertions. The tint of the body is a little more reddish than in the winged female.

Male (hitherto undescribed).—

Head broader than long, broadly rounded behind, the eyes large, moderately convex, about half as long as the sides of the head. Mandibles very small, blunt, edentate. Clypeus rather convex, with feebly and broadly excised anterior border. Antennæ long, filiform; scape about two-thirds as long as the second funicular joint, first funicular joint broader than long. Thorax broader through the wing insertions than the head, narrowed in front; promesonotal suture very deeply impressed. Mesonotum rather flat, with a median pit in front and well-developed Mayrian furrows. Scutellum convex, with a median sulcus so that it appears bituberculate. Base of epinotum somewhat longer than the declivity which is concave and strongly marginate on the sides and above. Petiole narrower, higher than long, the node truncated anteriorly and posteriorly and rounded above and on the sides; its ventral tooth triangular, short and rather acute. Postpetiole broader than long, convex above and sharply constricted off from the gaster, its anterior ventral border projecting as a transverse welt. Gaster of the usual shape, pygidium bluntly pointed at the tip. Legs moderately long and slender. Wings rather short (7.8 mm.).

Shining, finely punctate; thorax more or less rugulose, the pronotum finely, the pleuræ more coarsely, the scutellum and upper portion of the base of the epinotum reticulately rugose, the latter very coarsely. Upper portion of petiolar node very smooth and shining.

Hairs yellowish, present only along the posterior borders of the gastric segments. Pubescence grayish, very fine, covering the gaster, head, and legs.

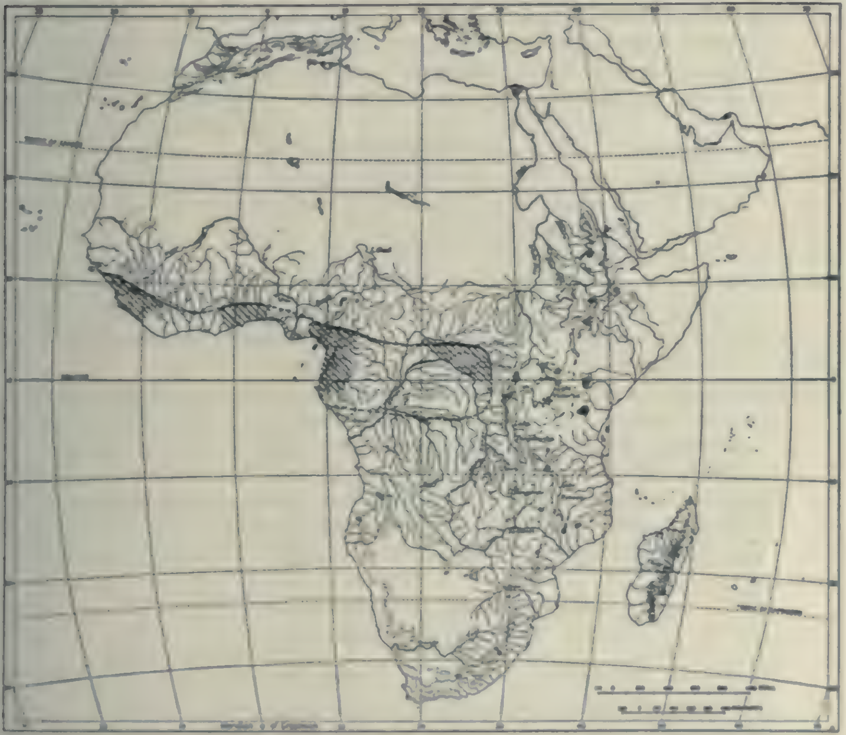
Black; mouth, mandibles, tibial spurs, and articulations of the legs, ventral portion of petiole, posterior and especially lateral, margins of the gastric segments, red. Wings uniformly brownish, veins and pterostigma dark brown.

The series from Stanleyville consists of a single worker, three females, and two males, all from the same colony. Another male from the same locality and with a different number is considerably larger (13 mm.) and evidently belongs to the same species but probably represents a distinct variety which cannot be named without the worker or female.

PSALIDOMYRMEX Ern. André

Rather large, dark reddish brown or black ants with the surface of the body covered with scattered umbilicate foveolæ, the spaces between which are in part at least densely striolate.

In the WORKER and FEMALE the clypeus is short and broad, its anterior border arcuate and entire. The frontal carinæ are approximated, dilated and lobular and concealing the antennal insertions. The mandibles have a very peculiar shape, being long, falcate, and toothless, ending in a long acute point and broadest just beyond their basal third where the basal and apical borders meet without forming a sharp angle as in most other ants. The antennal funiculi are slightly thickened apically, with the second joint conspicuously longer than the first. Eyes small and flat, placed near the anterior quarter or third of the sides of the head. Base of epinotum with a narrow longitudinal sulcus in the middle. Promesonotal suture very distinct, impressed. Mesoëpinotal suture indistinct or obsolete. Petiole with high rounded node, subtruncate in front and behind. Constriction between postpetiole and gaster pronounced and provided with well-developed stridulatory surfaces. Gaster small. Middle and hind tibiæ without lateral spurs, with a large pectinated median spur. The female is winged but in other respects closely resembles the worker.



Map 14. Distribution of the genus *Psalidomyrmex*.

The MALE resembles the male of *Plectroctena* but has smaller eyes and the mesonotum is without Mayrian furrows, the scutellum with a deep longitudinal sulcus.

Only four species of this interesting genus have been described. The Lang-Chapin collection contains a fifth, which is described below. They are all rare ants, inhabiting the virgin forest and apparently restricted to Western Equatorial Africa, from French Guinea to the Northeastern Congo (Map 14).

The workers of four species of *Psalidomyrmex*[1] can be readily identified by means of the following table.

1. Mandibles narrow, without distinct basal and apical borders, broadest near the middle, where they are scarcely more than one-eighth as broad as long; scapes not reaching to the posterior corners of the head; petiole longer than broad; dorsal surface of body smooth and shining between the foveolæ. *reichenspergeri* Santschi.

Mandibles much broader, with distinct basal and apical margins meeting at a right angle, broadest at their basal third and about one-third as broad as long; scapes reaching or surpassing the posterior corners of the head; petiole broader than long; interfoveolar surface of head, thorax and gaster, at least, finely striate..2.

2. Length 9 to 10 mm. Reddish castaneous; lobes of frontal carinæ smooth and shining; striæ on the postpetiole longitudinal.....*foveolatus* Ern. André.

Length about 12 mm. Brown-black or black, with brown antennæ, mandibles, clypeus, and legs; striæ on postpetiole arcuate........................3.

3. Head longer than broad; antennal scapes reaching beyond posterior corners of head; striæ on the head, thorax, and abdomen sharp; pronotum without a median longitudinal groove; mesoëpinotal suture obsolete; petiole slightly broader than long.................................*procerus* Emery.

Head as broad as long, antennal scapes shorter; striæ on head and thorax less distinct, foveolæ smaller; pronotum with a median longitudinal groove; mesoëpinotal suture distinct; petiole broader.......*obesus*, new species.

Psalidomyrmex procerus Emery

Text Figure 17

Medje, ☿; Akenge, ☿; Niapu, ☿ (Lang and Chapin). Nine specimens, all taken from the stomachs of toads (*Bufo superciliaris*, *funereus*, and *polycercus*).

Psalidomyrmex reichenspergeri Santschi

Text Figure 18

A single worker from the stomach of a toad (*Bufo polycercus*) taken at Akenge (Lang and Chapin).

This species is easily distinguished from *procerus* Emery and *foveolatus* André by its more slender form, smoother surface between the

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[1] *P. longiscapus* Santschi is only known in the female sex.

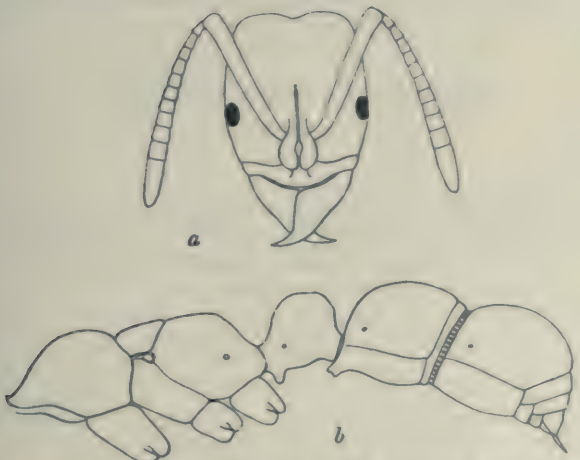


Fig. 17. *Psalidomyrmex procerus* Emery. Worker. *a*, head from above; *b*, thorax and abdomen in profile.

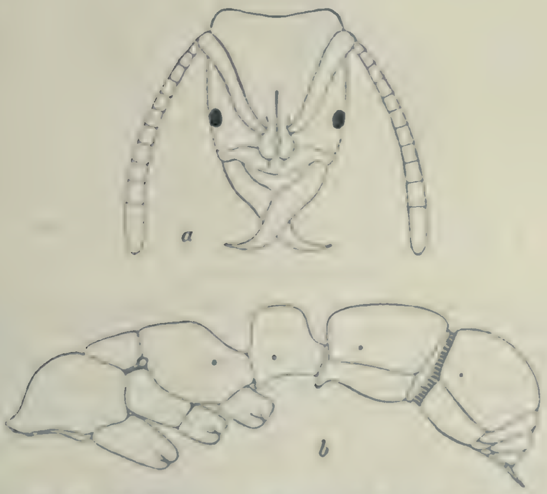


Fig. 18. *Psalidomyrmex reichenspergeri* Santschi. Worker. *a*, head from above; *b*, thorax and abdomen in profile.

foveolæ, the more rectangular head, more elongated and narrower mandibles, longer funiculi, longer petiole, and more distinct mesoëpinotal suture.

Psalidomyrmex obesus, new species

Text Figure 19

Worker.—

Length nearly 12 mm.

Very similar to *procerus* but differing in the following characters: the body is distinctly more robust, the head being rectangular, and without the mandibles as broad as long, the thorax with more rounded surfaces and a swollen appearance. The mandibles are like those of *procerus* but slightly broader at the angle between the basal and apical borders and the tips are less curved. The antennal scapes reach the posterior corners of the head; funicular joints 3 to 8 as long as broad, 9 and 10 slightly longer than broad. On the thorax the mesoëpinotal suture is more distinct than in *procerus* and there is a narrow median longitudinal furrow on the posterior half of the pronotum as well as on the base of the epinotum. The petiole in profile is much shorter and higher and, seen from above, much broader in proportion to its length than in *procerus*, being very distinctly broader than long, flat and truncated posteriorly, more rounded in front, with the anteroventral tooth long and rather acute.

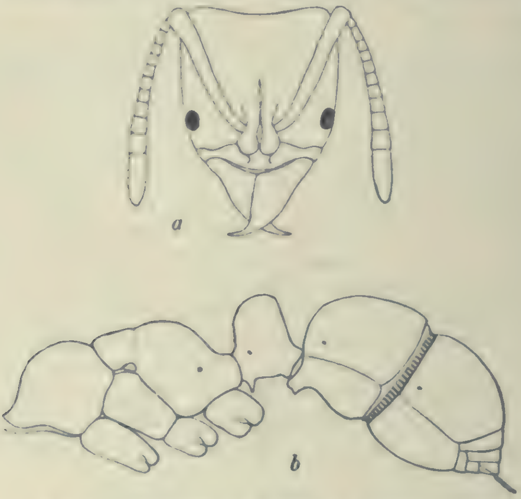


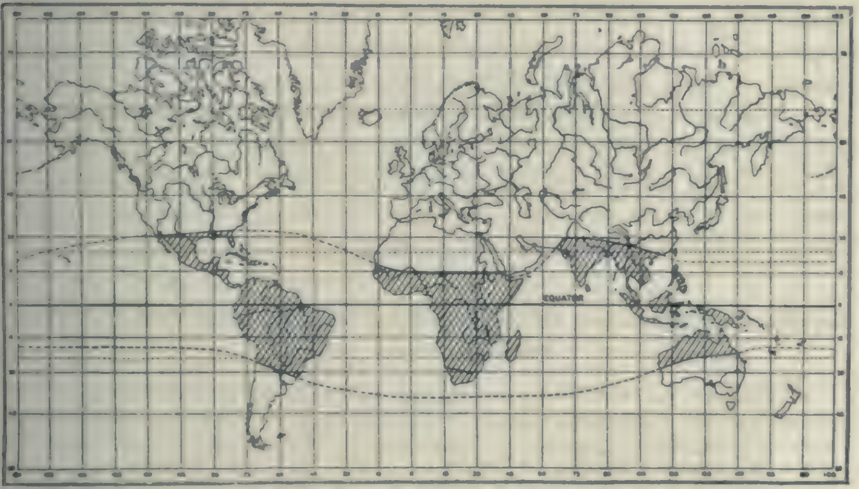
Fig. 19. *Psalidomyrmex obesus*, new species. Worker. *a*, head from above; *b*, thorax and abdomen in profile.

The sculpture differs from that of *procerus* as follows: the longitudinal rugæ covering the mandibles are distinctly coarser, the surface of the head and thorax is more opaque, the foveolæ being somewhat smaller, shallower and less shining, though about as numerous and the striolæ of the interfoveolar surface less sharp. The petiole and postpetiole are smoother and more shining than the head and thorax and the interfoveolar sculpture is so feeble as to appear more or less coriaceous or alutaceous. The first gastric segment is longitudinally, not arcuately striolate. The femora are transversely, the scapes and tibiæ longitudinally striolate as in *procerus*.

Erect hairs somewhat more numerous on the dorsal surface of the head and pronotum and on the antennal scapes.

Nearly coal black, darker than *procerus*, legs, excluding the coxæ, mandibles, clypeus, frontal carinæ, antennæ, and terminal gastric segments castaneous as in *procerus*.

Described from two specimens from Medje from the stomach of a toad (*Bufo superciliaris*) collected by Lang and Chapin. This form is certainly distinct and is, in my opinion, more than a subspecies of *procerus*.



Map 15. Distribution of the genus *Leptogenys*. This genus also occurs in Georgia.

Leptogenys Roger

Slender black or reddish ants, of small or medium size, sometimes with bluish iridescence.

The WORKERS are monomorphic and vary little in size. Mandibles articulated at the anterior corners of the head, almost or quite toothless and either long and linear or broader and subtriangular, usually with the angle between the basal and apical margin rounded or absent. Clypeus usually carinate and projecting in the middle in the form of a lobe or angle. Antennæ long and slender, the funiculi not enlarged or clubbed apically. Thorax usually with the mesoëpinotal suture distinct. Petiole either laterally or, in a few species, anteroposteriorly compressed. Abdomen small and slender, the constriction between the postpetiole and gaster not very pronounced. Legs slender, claws pectinated.

The FEMALE is wingless and scarcely larger than the worker, either highly ergatomorphic, without ocelli, with the thoracic structure as in the worker but with more voluminous abdomen, or ergatogynous, as in the case of *L. ergatogyna* described below, with ocelli and the thorax more like that of the winged females of other genera, but with the mesonotum and scutellum small and depressed.

The MALE is somewhat smaller than the worker and in some species much paler in color and nocturnal, with very large eyes and ocelli, very long antennæ, small mandibles, and pronounced Mayrian furrows on the mesonotum. The claws are pectinated as in the other phases.

Emery has divided the genus into four subgenera: *Leptogenys sensu stricto; Lobopelta; Odontopelta;* and *Machærogenys*. The species of *Leptogenys*, *sensu stricto*, are generally distributed in the tropics of both hemispheres. One *Lobopelta, L. elongata* (Buckley), occurs in the Gulf States from Central Texas eastward to Florida. *Odontopelta* is monotypic and confined to Queensland. Of *Machærogenys*, three species are known, all from Madagascar (Map 15).

Most species of *Leptogenys* form small colonies, each with a single female, and nest in the ground, usually under stones or logs. The workers are timid and extremely quick in their movements. Some species make organized raids on termites; others, like our North American *elongata*, forage singly and apparently only at night.

Leptogenys stuhlmanni Mayr subspecies **camerunensis** (Stitz) variety **opalescens,** new variety

WORKER.—Agreeing with the variety *angusticeps* Forel in all respects, except that the head, thorax, petiole, and to some extent also the gaster, have a peculiar opalescent blue reflection like that seen in *L. iridescens* (F. Smith) and *chinensis* (Mayr).

Thirteen workers taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (Lang and Chapin). Forel drew his description of *angusticeps* from a single specimen taken at St. Gabriel, near Stanleyville. He says nothing about the blue reflection, which is very striking, so that I am unable to refer the specimens to his variety.

The habits of the typical *stuhlmanni* have been studied by Arnold.[1] He says:

> I have met with this species only in Natal, where it appears to feed exclusively on woodlice; the entrance to the nest can be plainly distinguished by the accumulation of the remains of their prey, bleached a dead white, scattered around it. The nest is not indicated by any mound or other accumulation of earth; but in the neighborhood of Durban at least, it is very frequently found in, or immediately adjacent to, the nests of *Myrmicaria eumenoides* Gerst. I am inclined to think that this *Lepto-*

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[1] 1915, Ann. South African Mus., XIV, p. 93.

genys dispossesses the latter species of a part of their large nest, rather than take the trouble of excavating one for itself. It also has a very noticeable smell, resembling essence of pears.

In 1904[1] I recorded the fact that our North American species feeds very largely on slaters (*Oniscus* and *Armadillidium*) and that "the earth surrounding the entrances to the nests is invariably white with innumerable bleaching limbs and segments of the crustaceans." The use of the same food by two species of *Leptogenys* in such remote regions as Natal and Texas would seem to indicate that the habit must be rather general in the genus.

Leptogenys (**Lobopelta**) **ergatogyna**, new species

Text Figure 20

FEMALE.—

Length 7.3 mm.

Head longer than broad, narrower behind than in front, with feebly convex and rather large eyes, placed a little in front of the middle, and three small ocelli, the posterior distinctly smaller than the anterior. Mandibles rather broad, their basal and apical borders subequal, not forming an angle with each other. Clypeus carinate, produced as a sharp point or angle in the middle. Frontal carinæ erect, closely approximated; frontal groove distinct. Antennæ long and slender, scapes extending nearly half their length beyond the posterior border of the head; funicular joints long and slender, the second twice as long as the first, the third and fourth each nearly two-thirds as long as the second. Thorax long and narrow, elongate elliptical, scarcely broader than the head through the eyes, laterally compressed; pronotum large, as long as broad, depressed in profile; mesonotum, tegulæ, paraptera, and scutellum developed as distinct but small sclerites, without traces of wings. Mesonotum scarcely longer than the pronotum, somewhat longer than broad, with distinct parapteral furrows. Epinotum long and sloping, without base or declivity. Petiole as high as long, in profile shaped like the quadrant of a circle, its anterior surface evenly arcuate,

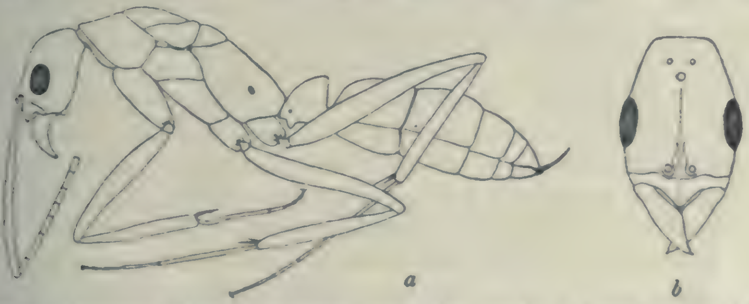

Fig. 20. *Leptogenys* (*Lobopelta*) *ergatogyna*, new species. Female. *a*, insect in profile; *b*, head from above.

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[1] 'A crustacean-eating ant (*Leptogenys elongata* Buckley).' Biol. Bull., VI, pp. 251-259.

its posterior surface sharply and vertically truncated, its ventral surface anteriorly with a coarse tooth. Seen from above, the petiole is only one and one-fourth times as long as broad, slightly broader behind than in front, with straight, subparallel sides. Abdomen slender, like that of a normal worker, not enlarged as in the ergatomorphic females of other species. Sting long. Legs long and slender.

Subopaque; mandibles somewhat more shining, finely shagreened and coarsely and sparsely punctate. Clypeus finely longitudinally rugulose; head, pronotum, mesonotum, paraptera, and scutellum densely and finely punctate; postpetiole and gaster more shining, even more finely but a little less densely punctate; pleuræ finely and longitudinally, epinotum transversely and somewhat more coarsely rugulose. Petiole finely and rather irregularly rugulose.

Hairs and pubescence whitish, the former very sparse, erect, delicate, confined to the head, fore coxæ, and tip of gaster, short on the last; the pubescence rather short and abundant on the head, postpetiole, gaster, and appendages.

Black; mandibles, antennæ, and legs, including the coxæ, dark brown; tarsi and funiculi scarcely paler.

Described from a single specimen taken from the stomach of a toad (*Bufo polycercus*) from Medje (Lang and Chapin).

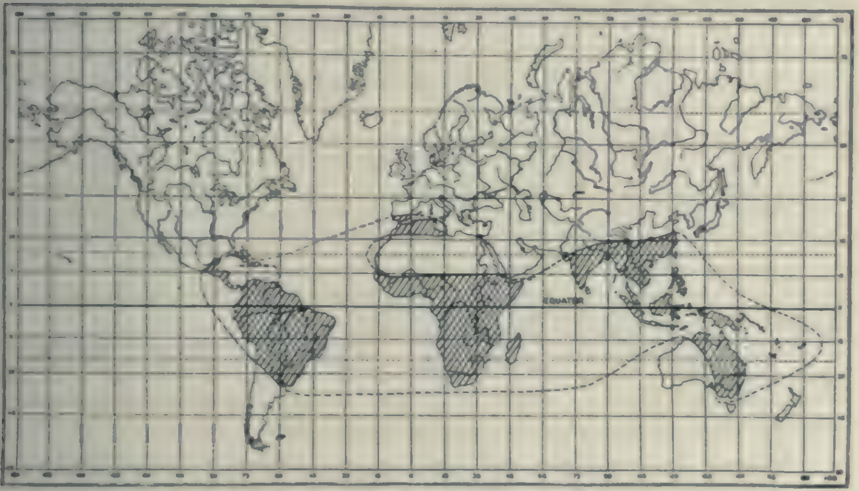
This remarkable insect I regard as the normal female of a species which must be very closely related to *L. havilandi* Forel, known only from the worker. In all the species of *Leptogenys* [*elongata* (Buckley), *diminuta* (Smith), *fallax* (Mayr), *arnoldi* Forel] of which the female is known, this phase is like the worker in the structure of the thorax and in lacking ocelli, but has a more voluminous abdomen. Of the female *arnoldi*, Arnold says that "the mesonotum is also larger and longer than in the worker," and I have found the same to be true of the Australian *fallax*. It would seem, therefore, if I am correct in my interpretation of the specimen above described, that it must be regarded as representing a stage in the degeneration of the formicid female intermediate between the common winged and the extremely ergatomorphic form, the only form of fertile female that has been seen hitherto in the genus *Leptogenys*.

ANOCHETUS Mayr

WORKER.—Small ants with monomorphic workers. Head irregularly hexagonal. Mandibles inserted close together at the middle of its anterior border, linear, flattened, with three large terminal teeth bent inward at a right angle and with the inner border toothless or furnished with a row of minute denticles. Eyes usually well developed, rarely vestigial, in front of the middle of the sides of the head. Clypeus small, subtriangular, anteriorly projecting over the insertions of the mandibles and extending backward as a narrow process between the short frontal carinæ, which are lobularly expended in front and more or less convergent posteriorly. Antennal foveæ not confluent behind; head without an oblique welt or swelling on each side starting from the eye and bounding the antennal fovea; sides of head without a marked impression behind the antennal fovea. Antennæ slender, 12-jointed; funiculi long, filiform, not enlarged apically. Thorax long and narrow, with distinct promesonotal and sometimes also mesoëpinotal sutures; epinotum usually dentate. Petiole with a node or scale which may be conical and may terminate in a spine, or in two teeth or spines. Gaster oval, convex above, without a constriction between the postpetiole and the succeeding segment. Legs slender; middle and hind tibiæ each with a single pectinated spur; claws simple.

FEMALE very similar to the worker; usually winged, but in some species wingless and ergatoid.

MALE with the head of the usual shape, large eyes and ocelli and very small mandibles; antennæ very long; scape short, first funicular joint broader than long. Petiole above more or less pointed or bidentate. No constriction between the postpetiole and the succeeding segment. Pygidium usually not terminating in a spine.



Map 16. Distribution of the genus *Anochetus*.

The genus comprises numerous species which form small colonies that nest in the ground under stones or in vegetable mould. Little is known of their habits. They range over the tropics of both hemispheres (Map 16), one species, *A. ghilianii* (Spinola), even entering Spain from Morocco. The subgenus *Stenomyrmex*, of which only two species are known, is confined to the Neotropical Region.

Anochetus africanus (Mayr)

A worker and a deälated female from Medje (Lang and Chapin) without further data.

Anochetus estus, new species

WORKER.—

Length about 4.5 mm.

Closely related to *A. africanus*. Head, excluding the mandibles, a little longer than broad, the posterior margin deeply and arcuately excised. Eyes small, like those of *africanus*. Clypeus deeply emarginate in the middle, its posterior portion long and cuneate. Frontal groove distinct between the clypeus and the middle of the head. Mandibles about half as long as the head, shaped much as in *africanus* but with the terminal teeth shorter and the bases somewhat narrower. Antennal scapes not reaching to the posterior corners of the head; second funicular joint not longer than broad, third scarcely longer, joints 4 to 7 not twice as long as broad. In *africanus* all the funicular joints are much longer. Thorax shaped as in *africanus*, the pronotum rounded but not convex above, the mesoëpinotum long, narrower and subcylindrical, with broad blunt epinotal teeth. The petiolar scale is high and compressed anteroposteriorly as in *africanus*, with feebly excised superior border, but the latter is more acute and the sides are nearly straight and subparallel (in *africanus* rounded). Gaster and legs of the usual type.

Shining; the upper surface of the head, except the impressions, sides and posterior corners subopaque and longitudinally rugulose, the rugules being regular and spreading fanwise from the frontal carinæ. Thorax subopaque, the pronotum longitudinally and arcuately rugulose, except in front where the rugules are transverse, the meso- and epinotum transversely rugulose. The sculpture is distinctly finer than in *africanus*. Petiole and gaster very smooth and shining. Mandibles very indistinctly and finely punctate, smoother than in *africanus*.

Hairs slender, yellowish, erect, sparse on the body, absent on the appendages, which are very finely pubescent.

Deep castaneous brown, almost black, with the appendages, sides and posterior corners of head, mandibles, clypeus, and tip of gaster paler brown.

A single specimen from Akenge (Lang and Chapin) taken from the stomach of a toad (*Bufo funereus*).

Anochetus opaciventris, new species

WORKER.—

Length 6.5 to 7 mm.

Allied to *africanus*. Head longer than broad, deeply and arcuately excised behind, with small eyes as in *africanus*, clypeus, frontal groove, and antennæ much as in that species, the scapes extending beyond the middle of the occipital border a distance equal to the length of the first funicular joint, the funicular joints even longer and more slender than in *africanus*, the third fully twice as long as broad, the second somewhat shorter. Mandibles fully three-fifths as long as the head, narrowed at the base, broadened apically as in *africanus* and *estus*, with straight internal border, the apical and preäpical teeth long and slender, the subapical very short, triangular, not longer than broad, arising from the base of the apical. Thorax and petiole similar to those of *africanus* but the teeth in the former longer, more acute and erect, the latter narrower, with more deeply excised superior border so that it terminates on each side in a larger and sharper tooth, and with more nearly straight, subparallel sides. In profile the anterior and posterior surfaces of the petiole are distinctly convex, the ventral surface without a tooth.

Mandibles shining, smooth; head subopaque, finely and regularly longitudinally rugulose, the rugules spreading fanwise from the frontal carinæ; clypeus, antennal foveæ, sides, and posterior corners of head smooth and shining. Thorax opaque, coarsely rugose, the rugæ irregular but with a feebly longitudinal trend on the pronotum, transverse on the mesonotum, more vermiculate on the epinotum. Petiole rather shining, coarsely coriaceous; gaster subopaque, densely punctate, the posterior margins of the segments more shining.

Hairs delicate, white, rather short and abundant, erect on the body; scapes and legs with dense oblique, short hairs which are also very fine and might be described as long pubescence.

Black; mandibles, clypeus, cheeks, gular surface of head, antennæ, and legs, including the coxæ, dark brown, the middle portions of the femora darker. Posterior margins of gastric segments golden yellow.

Described from three specimens taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (Lang and Chapin).

Anochetus bequaerti Forel

A single specimen taken from the stomach of a toad (*Bufo regularis*) from Garamba (Lang and Chapin).

Anochetus punctaticeps Mayr

Eighteen workers from Babeyru, forming part of a colony "found under bark on a large tree" (Lang and Chapin).

ODONTOMACHUS Latreille

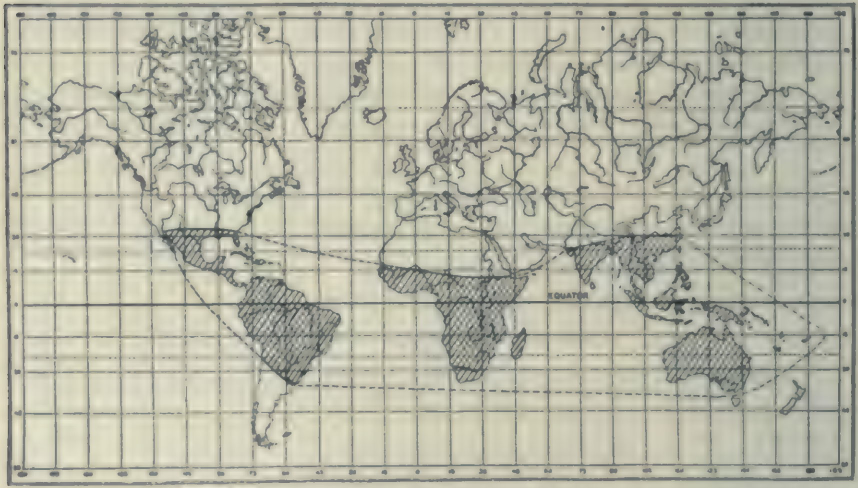
Medium-sized or large ants closely resembling *Anochetus*.

In the WORKER, however, the antennal foveæ are confluent, being united by a depression of the front behind the frontal carinæ, and there is a welt or swelling which extends out obliquely from the eye and separates the antennal fossa from a depression, equally oblique and very pronounced on the side of the head. Both the apical and subapical teeth of the mandibles acute, the preäpical truncated or acute, according to the species; the inner border of the mandibles usually minutely and serrately toothed. Maxillary palpi 4-jointed, labial palpi 3-jointed. Eyes always well developed. Petiole surmounted by a conical node usually terminating in a spine which is inclined backward.

FEMALE winged, with large eyes and ocelli, but in other respects like the worker.

MALE with the head of the ordinary shape and with very large eyes and ocelli; mandibles very small; maxillary palpi 6-jointed. Antennæ as in *Anochetus*. Petiole ordinarily with a pointed or conical node, but without terminal spine. Postpetiole separated from the succeeding segment by a rather pronounced constriction. Pygidium terminating in a spine. Claws simple.

Odontomachus is a tropicopolitan genus with apparently two centers of distribution, one in the Neotropical, the other in the Indonesian and Australian Regions (Map 17). One species, *O. hæmatoda*, represented by numerous subspecies and varieties, is found in all the warmer regions of the globe, even in the Southern United States, though not in the Mediterranean Region. The species all nest in small colonies in the ground or in rotten wood and the workers of some of the species are very aggressive and sting severely. They are able to leap backward a distance of several inches by suddenly closing their divaricated mandibles against any hard body that happens to be in the environment. The genus is poorly represented in Africa.



Map 17. Distribution of the genus *Odontomachus*.

Odontomachus assiniensis Emery

Text Figure 21

Akenge, ☿; Medje, ☿; Ngayu, ☿; Niangara, ☿; Niapu, ☿. Eighty-six specimens, all taken from the stomachs of four species of toads (*Bufo polycercus, superciliaris, funereus,* and *tuberosus*) collected by Lang and Chapin.

Stitz has described an *O. intermedius* which differs from the typical *assiniensis* only in having the striæ on the pronotum of the worker more arcuately concentric and therefore more as in *O. hæmatoda* and not simply transverse. A study of the long series of specimens before me shows that there is great variation in the pronotal striation, many specimens agreeing with Stitz's description; others having the striæ in an asymmetrical whorl like that exhibited by the ridges on the tips of the fingers, and in a considerable number the striæ are simply transverse, as described by

Emery for the typical *assiniensis*. I do not regard these differences as more than nest variations and have therefore relegated Stitz's *intermedius*, which Santschi is willing to regard as a subspecies of *assiniensis*, to the synonymy.

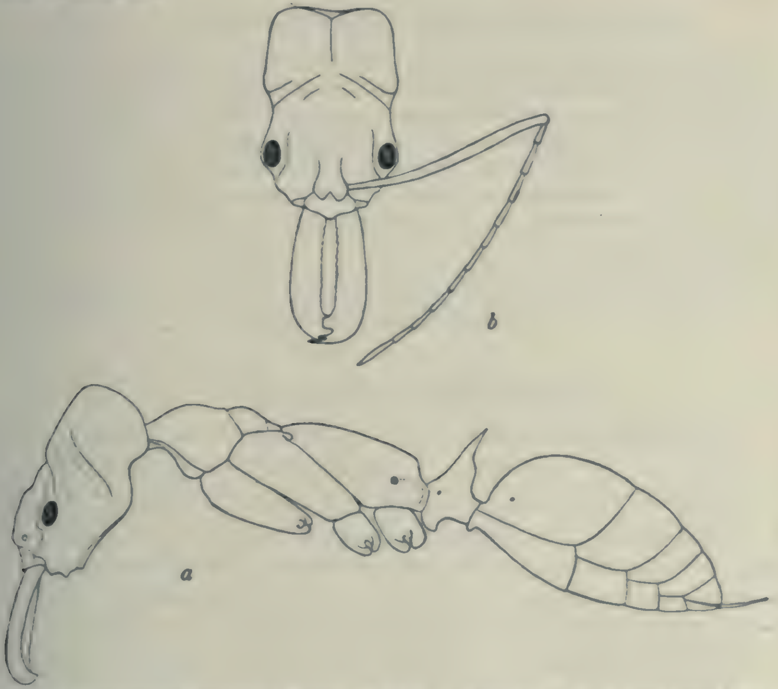


Fig 21. *Odontomachus assiniensis* Emery. Worker. *a*, body in profile; *b*, head from above.

Odontomachus assiniensis variety **furvior,** new variety

WORKER.—Length 9 to 12 mm. Differing from the typical form in its darker color. The abdomen is black, the head and thorax deep castaneous, almost black, with the bases of the mandibles, lower surface of the head and concavities of its upper surface, mesopleuræ, legs, and antennæ somewhat paler and more reddish; in some specimens the tibiæ are still paler.

FEMALE (deälated).—Length nearly 15 mm. Darker than the worker, black, with the legs and antennæ dark brown. Mandibles smoother and more shining than in the worker. The transverse rugæ on the pronotum and the longitudinal rugæ on the mesonotum much coarser than in *O. hæmatoda* and the whole thorax more shining. The pubescence is lacking, even on the gaster, which is very shining.

Described from nine workers from Faradje (type locality) and numerous others from Yakuluku, Stanleyville, Bafwasende (Lang and Chapin), and Thysville (J. Bequaert). In addition to these, there are thirty workers and one female (the one described above) taken from the stomachs of toads (*Bufo polycercus, funereus*, and *superciliaris*) from Medje, Ngayu, Akenge, Boyulu, and Niangara.

Odontomachus assiniensis variety **aterrimus,** new variety

Worker.—Length about 10 mm. Differing from the variety *furvior* in being entirely jet black, including the appendages. The sculpture of the head and thorax is distinctly finer than in any of the other forms of the species, so that the surface is more shining. The legs are smoother and also more shining, especially the femora, than in any of the other forms. The unsculptured surfaces of the body, viz., the antennal foveæ, the mesopleuræ, lower portion of epinotum, and the gaster have a distinct blue opalescence. The longitudinal groove on the dorsal surface of the epinotum is continuous.

Described from a single specimen found in the stomach of a frog (*Rana albolabris*) from Niapu (Lang and Chapin).

Odontomachus hæmatoda (Linnæus)

Stanleyville, ☿; Malela, ☿, ♀ (Lang and J. Bequaert); Faradje, ☿; Zambi, ☿, ♀; Avakubi, ☿; Leopoldville, ☿; Vankerckhovenville, ☿; Garamba, ☿; Akenge, ☿ (Lang and Chapin); Matadi, ☿; Katala, ♀ (J. Bequaert). All this material belongs to the typical tropicopolitan form, distributed apparently throughout the Ethiopian Region. The specimen from Akenge was taken from the stomach of a toad (*Bufo funereus*) and a specimen from Faradje was taken from the stomach of a frog (*Rana occipitalis*). In connection with the well-known leaping habit of this ant, Mr. Lang makes the following remark: "This leaping may be of some practical use to the ants when scaly ant-eaters (*Manis*) open their nests. Those jumping out of the immediate range of its glutinous tongue would be fairly safe, since the *Manis* feeds only where the ants and their larvæ are thickest and seldom looks for single individuals."

Odontomachus hæmatoda variety **stanleyi,** new variety

Worker.—Length 7 to 8 mm. Distinctly smaller than the typical *hæmatoda*, with a distinctly narrower head and the mandibles, antennæ, thorax, legs, and gaster paler and reddish castaneous brown. In many specimens the cheeks, clypeus, antennal foveæ, gula, and borders of the mandibles are yellowish. Petiole with longer and more uniformly slender spine. Sculpture of the head and thorax as in the typical *hæmatoda*, but with the gray pubescence on the gaster distinctly longer and more conspicuous. The sides of the head are much less smooth and shining than in the Neotropical subspecies *insularis* (Guérin), which is of the same size though paler in color.

Described from numerous specimens from two colonies taken at Stanleyville (Lang and Chapin). The cocoons are also distinctly paler than those of the typical *hæmatoda*.

Pseudomyrminæ

WORKER monomorphic, very rarely slightly dimorphic. Body elongate, often very slender. Clypeus with rounded posterior margin, not prolonged back between the frontal carinæ; in certain species of *Pseudomyrma* there is an apparent posterior prolongation which, however, is the equivalent of the frontal area and is often separated from the clypeus. Antennæ 12-jointed, short. Ocelli usually developed. Pedicel usually long, formed by the petiole and the postpetiole. Gaster with well-developed sting. Middle and hind tibiæ with pectinate median spurs. The proventriculus or "gizzard" is much more specialized than in the Myrmicinæ, being anteriorly developed as an apple- or quince-shaped ball, covered with longitudinal and circular muscles and with four distinct, connate sepals, bluntly rounded and finely hairy at their tips, and posteriorly as a very short, tubular, constricted portion which projects as a button into the cavity of the ventriculus.

FEMALE very similar to the worker, also with 12-jointed antennæ; either winged, or ergatoid and wingless, or subapterous. All three forms of females occur together in the same nest of *Viticicola*. Wings with a discoidal and a closed radial cell; two closed cubital cells, rarely one (*Viticicola*).

MALE also rather similar to the worker; the antennæ 12-jointed. External genitalia well developed, exserted; cerci present.

"The adult LARVÆ of all four genera of Pseudomyrminæ are much alike. The body is long, straight and cylindrical, not broader posteriorly as in nearly all other ant larvæ. The anterior and posterior extremities are blunt and rounded and the segments are all sharply defined. The integument is uniformly thin and perfectly transparent, though tough, only the mandibles, as a rule, being strongly chitinized and the lining of the buccal cavity somewhat pigmented. The prothoracic segment is large and hood-shaped, and in certain species can be drawn down over the head; the meso- and metathoracic segments are narrowed ventrally, the head is large, somewhat flattened, usually subrectangular, about as broad as long and embedded in the ventral portions of the thoracic segments. The antennal rudiments are always distinct as small, rounded papillæ, each bearing three sensillæ. The mandibles are small, stout and bidentate, sometimes with a vestige of a third tooth, their upper surfaces covered with regular rows of subimbricate papillæ. The maxillæ are large, swollen and rounded, lobuliform, the labium short and broad, with the transverse, slit-shaped opening of the salivary duct in the middle. The sensory organs which in many other ants have the form of papillæ or pegs on the maxillæ and labium are in the Pseudomyrminæ usually reduced to small areas or feeble eminences, bearing the groups of sensillæ. The anterior maxillary organ has five, the posterior two and each labial organ has five of these sensillæ. The buccal cavity is broad and transverse, its dorsal and ventral walls being in contact and both furnished with fine, regular transverse ridges (*trophorhinium*). Each thoracic segment bears a rounded papilliform exudatorium ventrally on each side next to the head. The sternal portion of the first abdominal segment is transversely elliptical, swollen, protuberant and furnished with a food-pouch, the *trophothylax*, opening forward, i. e., towards the mouth-parts. The hairs on the body of the larva are of three kinds: first, short, stiff, very acute hairs, generally and rather evenly distributed over the whole surface (*microchætæ*); second, much longer, stouter, more gradually tapering, lash-like and somewhat curved hairs of unequal length, singly or in a row or loose cluster on each ventrolateral surface of each abdominal segment (*acrochætæ*); and third, long hairs, of uniform length, only slightly tapering, with hooked tips (*oncochætæ*). These are normally present in transverse rows of four to eight on the dorsal surfaces of the three thoracic and first three to eight abdominal segments. On the more posterior segments they are often represented by simple, i. e., pointed hairs."[1]

NYMPHS not enclosed in a cocoon.

In 1899 Emery,[2] after a comparative study of the larvæ of several formicid genera, proposed to separate *Tetraponera* and *Pseudomyrma* from the remainder of the Myrmicinæ to form the new subfamily of the Pseudomyrminæ. His arguments, however, based on fragmentary material, seemed not convincing at that time; long since Emery himself has reunited these genera with the Myrmicinæ and in this he has been followed by all other myrmecologists up to the present. A recent study of numerous larvæ of this group, belonging to the four known genera, has convinced me that we must return to Emery's conception of 1899. I have endeavored to show in a recent paper[3] that neither the larval nor the imaginal Metaponini can be regarded as at all closely related to the Pseudomyrminæ; consequently that tribe should be retained among the Myrmicinæ.

Like the Dorylinæ and Cerapachyinæ, the Pseudomyrminæ are typically inhabitants of the warmer parts of the world; a small number of forms enter the southernmost portions of the Nearctic and Palearctic Regions.

TETRAPONERA F. Smith

WORKER.—Small, monomorphic or very rarely (in one South African species, *T. ambigua* Emery, according to Arnold) with the head dimorphic. Body long and slender. Head subrectangular, with large or very large, moderately convex eyes, one-third to two-fifths as long as the head; ocelli vestigial, often absent. Mandibles short and stout, with distinct basal and apical border, the latter with a small number of subequal teeth. Clypeus extremely short, steep, elevated in the middle but not extending back between the frontal carinæ, the anterior border emarginate, dentate or crenulate. Frontal carinæ small, short, closely approximated, lobular anteriorly, often slightly diverging behind. Maxillary palpi 5-jointed; labial palpi 4-jointed. Antennæ short, 12-jointed, the funiculi somewhat thickened at their tips, without distinct clava. Thorax narrow, with well-developed promesonotal and mesoëpinotal sutures and a distinct metanotal sclerite, often constricted in the mesoëpinotal region. Epinotum large and rather high, always unarmed. Petiole and often also the postpetiole pedunculate, rather long and slender, both with low, rounded nodes, their ventral portions not swollen or with stout teeth. Gaster narrow and elongate oval, with well-developed, exserted sting. Middle and hind tibiæ with pectinated median spurs; claws toothed.

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[1] Wheeler, W. M. and Bailey, I. W., 1920. 'The feeding habits of pseudomyrmine and other ants.' Trans. Amer. Phil. Soc. Philadelphia, N. S., XXII, pt. 4, pp. 235–279, Pls. I–V.

[2] 1899, 'Intorno alle larve di alcune formiche.' Mem. Accad. Sc. Bologna, (5) VIII, pp. 3–10, 2 Pls.

[3] Wheeler, W. M., 1919. 'The ants of the genus *Metapone* Forel.' Ann. Ent. Soc. America, XII, pp. 173–191, 7 figs.

FEMALE very similar to the worker and scarcely larger, winged; the wings short, the anterior pair with a discoidal, two closed cubital cells and a rather narrow, closed radial.

MALE scarcely smaller than the worker and very similar except for the wings. Head shorter. Eyes and ocelli well developed, convex. Mandibles well developed, with dentate apical borders. Antennæ 12-jointed, the scape but little longer than the second funicular joint, the first joint much shorter than the second, not swollen. Mesonotum depressed, not overarching the pronotum, without Mayrian furrows and with very feeble parapsidal furrows. There is, at least in some species, a concavity in the pro- and mesosterna, extending dorsally nearly to the mesonotal scutum. External genitalia well developed, exserted. Cerci present. Wings as in the female.

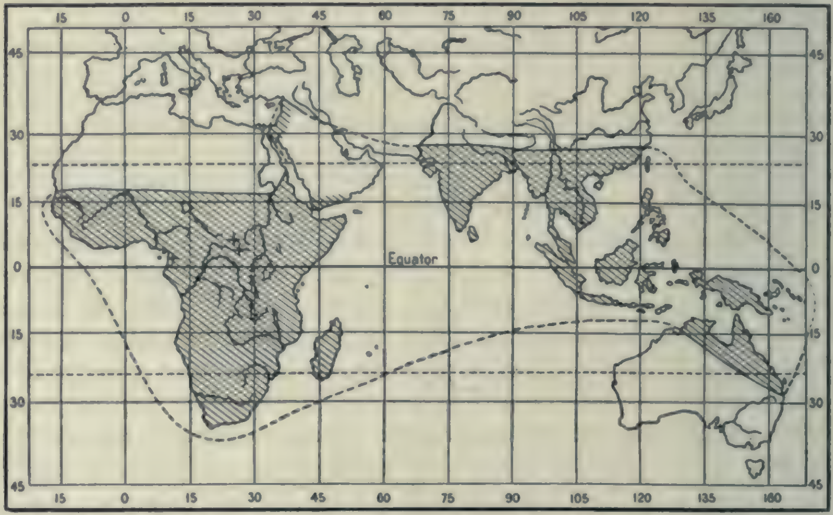
LARVA hypocephalic, with papillary exudatoria on the three thoracic and first abdominal segments. Dorsal surface with long straight hairs, hooked at their tips.

Donisthorpe (1916, Ent. Record, XXVIII, pp. 242–244) has shown that *Sima* Roger, the name used by most authors for this genus, must be sunk as an isonym of *Tetraponera* F. Smith, contrary to Emery's contention (1915, Zool. Anzeiger, XLV, p. 265). The case seems to be very clear, as Smith founded his genus *Tetraponera* (1852) on two species, *atrata* (= *Eciton nigrum* Jerdon) and *testacea*. The latter he afterwards (1855) placed in the genus *Pseudomyrma*. Roger founded his genus *Sima* in 1863 on *S. compressa* Roger (= *Pseudomyrma? allaborans* Walker). Later (1900) Emery separated the genus *Sima* into two subgenera, *Sima*, *sensu stricto*, and *Tetraponera*, the former with, the latter without ocelli in the worker and selected *Eciton rufonigrum* Jerdon as the type of *Sima*, *sensu stricto*. This was an improper procedure, since the worker of Roger's type species, *S. allaborans* has no ocelli.

Examination of the males of several of the Indomalayan species of *Tetraponera* shows that they all have 12-jointed antennæ. This is also true of the males of *Pachysima*, *Viticicola*, and even of *Pseudomyrma* and, hence, of the whole tribe Pseudomyrmini of Emery. Nevertheless, in his recent classification of the Myrmicinæ (1914, Rend. Accad. Sc. Bologna, p. 34) he cites the males of this tribe as having 13-jointed antennæ. Bingham and Arnold also give the same number for *Tetraponera*, and Santschi, who was the first to describe the male of *Pachysima æthiops*, failed to notice that it has 12-jointed antennæ.

The genus *Tetraponera* is distributed over the Ethiopian, Malagasy, Indomalayan, Papuan, and Australian Regions (Map 18), being best represented in the Ethiopian and Indomalayan. One species, *T. bifoveo-*

lata (Mayr), was taken by Dr. W. M. Mann as far north as Palestine. The species all nest in plant cavities (dead wood, twigs, stems of lianas, acacia spines, etc.) and are very quick in their movements. Their habits throughout are very similar to those of the allied Neotropical genus *Pseudomyrma*. The species of the latter, however, are much more numerous and constitute an abundant and conspicuous part of the Neotropical ant-fauna, whereas the species of *Tetraponera* are comparatively rare ants.



Map 18. Distribution of the genera *Tetraponera* (crossed area) and *Viticicola* (known localities indicated by crosses).

Tetraponera anthracina (Santschi)

Stanleyville, ☿ (Lang and Chapin); Lubutu, ☿; Thysville, ☿ (J. Bequaert). Five specimens which agree perfectly with Santschi's description of the types from the French Congo. Kohl found this species nesting in the hollow twigs of *Barteria fistulosa* and Bequaert's specimens from Thysville bear the note, "running on leaves and twigs of *Barteria fistulosa* whose cavities were apparently not inhabited by ants. Forest gallery in savannah. I have not seen their nest."

Tetraponera mocquerysi (Ern. André) variety **lepida,** new variety

Worker.—Length 6.5 to 7 mm. Differing from the typical form of the species in color, the thorax, petiole, gaster, and coxæ being very dark brown or black; the head, mandibles, antennæ, legs, anterior and posterior ends and ventral surface of the petiole, brownish yellow. Vertex with a large, transversely elliptical black spot reaching on each side nearly to the orbit. In one specimen the posterior portion of the pronotum is red. Shape of head and thorax, sculpture and pilosity of the body very much as in the typical form.

FEMALE.—Length 6.5 mm. Very similar to the worker. Posterior borders of gastric segments brownish. Wings grayish hyaline, with pale brown veins and dark brown pterostigma.

Described from two workers from Faradje (type locality) and one from Yakuluku and a single female from Garamba (Lang and Chapin).

Tetraponera mocquerysi subspecies **emacerata** (Santschi)

Stanleyville, ☿; Faradje, ☿ (Lang and Chapin); Lubutu, ☿; Kasonsero on the Semliki River, ☿ (J. Bequaert). In the narrow head and in coloration, the workers agree with Santschi's figure and description. The females, two in number, are deälated and have the head narrow as in the workers, but with the cheeks more concave, the anterior border more dilated, and the posterior corners more rectangular and less rounded. They measure 7 to 7.5 mm.; the workers about 5 to 6 mm.

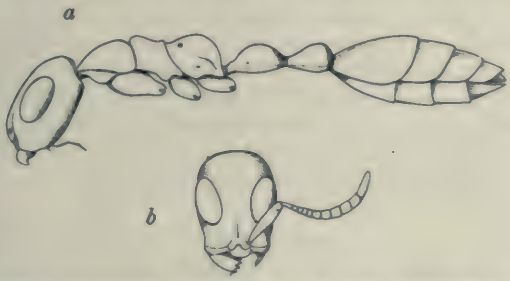


Fig. 22. *Tetraponera ophthalmica* (Emery). Worker. *a*, body in profile; *b*, head from above.

Tetraponera ophthalmica (Emery)

Text Figure 22

Nine workers taken by Dr. Bequaert at Thysville agree perfectly with Emery's description. The species is very easily recognized by its huge eyes. The specimens were found "running on limbs of *Barteria fistulosa*, whose cavities were not inhabited by ants."

VITICICOLA Wm. M. Wheeler

WORKER.—Closely related to *Tetraponera*. Head convex, and rounded behind, with the clypeus and mandibles shaped as in some species of *Tetraponera*, the external border of the mandibles deeply emarginate at the base. Eyes much smaller, only about one-sixth as long as the sides of the head, flat; ocelli usually absent, sometimes the anterior present. Frontal carinæ short, farther apart than in *Tetraponera* but shorter and closer together than in *Pachysima*. Frontal area and frontal groove obsolete. Antennæ short, 12-jointed; the funiculi with distinct 3-jointed club, the first funicular joint very long, joints 2 to 7 very short and transverse. Both maxillary and labial palpi 3-jointed. Thorax much as in *Tetraponera* but more thickset, the pronotum convex and rounded, not marginate or submarginate on the sides, the epinotum very high and convex, hemispherical, with the epinotal gland on each side very long and narrow, extending obliquely upward and forward to the middle of the lateral surface of the segment. Petiole and postpetiole stout, without peduncles, the nodes from above not longer than broad, their ventral portions swollen, without teeth. Gaster and tibial spurs as in *Tetraponera* but the tarsal claws are simple, not toothed.

Female winged, or ergatoid and wingless, exhibiting also subapterous forms. Even the winged form is much like the worker, but has well-developed ocelli, though the eyes are small and flat. Pronotum large and well developed; mesonotum depressed, flat. Petiole and postpetiole even broader and stouter than in the worker; both broader than long.

Male.—Clypeus longer than in the worker and female; mandibles similar with dentate apical borders. Antennæ short, 12-jointed, the second funicular joint much shorter than the scape, not longer than the first, which is slightly swollen. Eyes and ocelli rather large and convex. Mesonotum flattened or depressed, without Mayrian furrows and with very indistinct parapsidal furrows, not overarching the pronotum. There is a very deep and wide excision, separating the pro- and mesosterna and extending dorsally nearly to the mesonotal scutum. Petiole and postpetiole much as in the worker and female, but with their ventral portions even more swollen and convex. Genitalia extruded, less robust than those of *Pachysima* and *Tetraponera*. Wings with a discoidal cell, a rather broad, closed radial cell and only one cubital cell.

Larva hypocephalic as in *Pachysima* and *Tetraponera* and like that of the latter genus in the development of the exudatoria and dorsal hairs.

Genotype.—*Sima tessmanni* Stitz.

This monotypic genus seems to me to be sufficiently distinct from *Tetraponera*. The single species is highly specialized in adaptation to life in the stem cavities of a peculiar liana, *Vitex Staudtii* (*vide infra*). The eyes have dwindled and the ocelli have disappeared; the venation of the wings has become more simple and there is a pronounced tendency for the production of wingless and subapterous females—a condition unknown in any species of *Tetraponera*. This peculiarity, the pale color, and the small eyes indicate that the ants never leave the cavities of their host plant, except when the latter is disturbed or during the marriage flight, and the very pale color of the males indicates that this flight must occur at night. The conspicuous development of the epinotum and of its glands suggests conditions like those in some species of *Crematogaster* of the subgenus *Physocrema* (*inflata*, *difformis*, *vacca*, *stethogompha*, etc.) of the Indomalayan Region, the workers of which are supposed to feed on the secretions of one another's epinota (Bingham). As at present known, the distribution of the new genus is restricted to Spanish Guinea and the Ituri Basin of the Belgian Congo (Map 18). It probably also occurs in Cameroon.

Viticicola tessmanni (Stitz)

Text Figures 23 and 24

WORKER.—

Length 3 to 3.5 mm.

Head longer than broad, a little broader behind than in front, with feebly concave cheeks, rounded posterior corners and nearly straight posterior border, and, on the vertex, with a short longitudinal impression at one end of which the anterior ocellus is sometimes distinctly developed. Posterior ocelli absent. Eyes very small, flat, shorter than half their distance from the mandibular insertions, placed a little in front of the middle of the head. Mandibles short, rather strongly angulate at the base externally, their apical margins oblique, with 5 or 6 denticles, those at the base often indistinct. Clypeus convex and evenly rounded in the middle, its anterior border projecting, entire, strongly emarginate on the sides. Frontal groove absent. Antennæ short, scapes not reaching to the middle of the head, first funicular joint much longer than broad, joints 2 to 8 much broader than long, crowded together, joints 9 to 11 forming a three-jointed club, the last joint being as long as both the others, which are subequal and somewhat broader than long. Thorax narrower than the head, constricted in the mesonotal region. Pronotum from above a little broader than long, evenly rounded and convex; mesonotum transversely subelliptical, feebly convex, surrounded by impressed sutures. Metanotum nearly as long as the mesonotum, concave, with uneven surface. Epinotum very convex and rounded, egg-shaped from above, semiglobose in profile, as high as the pronotum or slightly higher, with the slit-shaped epinotal glands shining through the integument and conspicuously enlarged. Petiole short, scarcely longer than broad, broader behind than in front, convex and rounded above. In profile, its ventral surface is also convex and protuberant, with a small, compressed, blunt, translucent tooth anteriorly. Postpetiole a little broader than the petiole, scarcely broader than long and scarcely broader behind than in front, convex and rounded above and below. Legs and gaster of the usual shape, the latter with well-developed sting.

Very smooth and shining, including the mandibles; impunctate under a magnification of 20 diameters.

Hairs golden yellow, erect, of uneven length, sparse, most numerous on the gaster, especially along its sides. These regions also have more numerous short hairs or suberect pubescence. Antennæ and legs with shorter, more appressed hairs. Cheeks and clypeus densely and conspicuously pubescent, the latter without a fringe of cilia-like bristles.

Clear brownish yellow, with the borders of the mandibles, clypeus and frontal carinæ brown.

FEMALE (deälated).—

Length 4.5 to 5 mm.

Very similar to the worker. Thorax elongate elliptical, somewhat flattened above. Mesonotum as long as broad; epinotum subcuboidal, with subequal base and declivity meeting at a rounded right angle in profile, rather sharply marked off by impressed sutures from the more anterior portion of the thorax. Petiole and postpetiole from above subequal and of similar shape, broader than long. Gaster proportionally larger than in the worker.

Sculpture, pilosity and color as in the worker but the hairs and pubescence longer and more abundant. The pubescence is very conspicuous, extending back over the

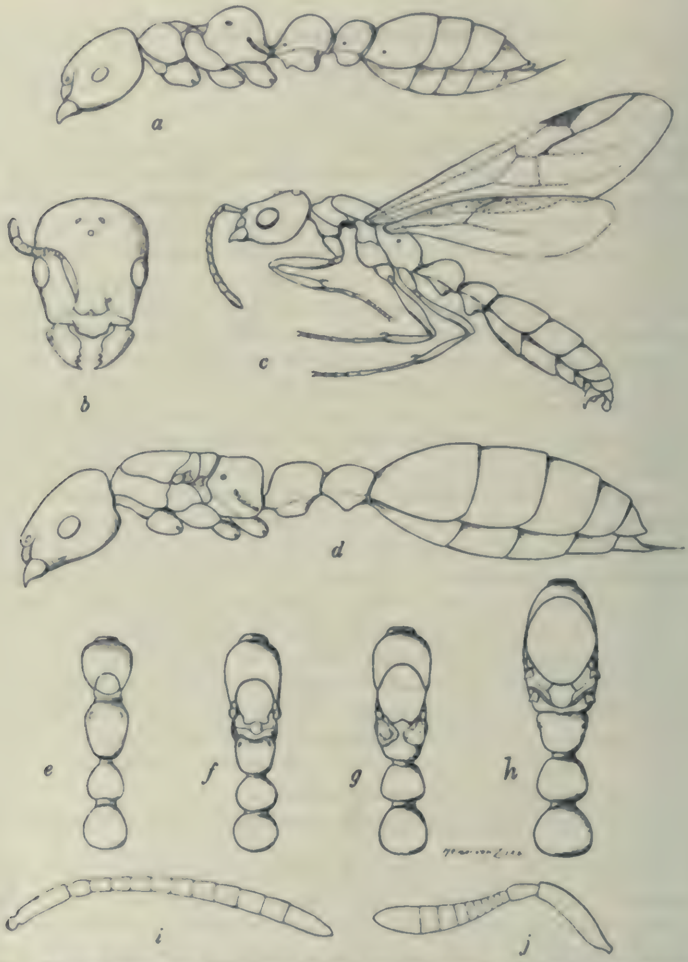


Fig. 23. *Viticicola tessmanni* (Stitz). *a*, body of worker in profile; *b*, head of worker from above; *c*, male in profile; *d*, body of deälated female in profile; *e*, thorax and peduncle of worker from above; *f* and *g*, thorax and peduncle of two subapterous females from above; *h*, thorax and peduncle of deälated female from above; *i*, antenna of male; *j*, antenna of worker.

sides and front of the head and especially on the pleuræ, epinotum, and nodes of the pedicel. As in the worker, the hairs and pubescence are longest on the sides of the gaster.

FEMALE (ergatoid).—

Length 3.5 to 4.5 mm.

Intermediate in the structure of the thorax, head, and abdomen between the the worker and true female, possessing ocelli and with the mesonotum varying in size, as shown in the figures (Fig. 23*f*–*g*), as the specimen approaches the worker or female type more closely. The wings are represented by minute brownish or blackish tubercles, the anterior pair with vestigial tegulæ at their bases. Some specimens

(Fig. 23*g*) have the fore wings more developed as a pair of triangular pads with indistinct, contorted veins, and folded back over the anterior corners of the epinotum. The pilosity and pubescence are also intermediate between the worker and female; the color the same.

MALE.—

Length 2.6 to 3 mm.

Head, including the eyes, distinctly longer than broad, rounded behind and impressed in front of the anterior ocellus. Cheeks short. Eyes and ocelli rather large, convex. Mandibles small but with distinct, denticulate borders. Clypeus convex, its anterior border rounded and somewhat projecting. Frontal carinæ very short. Antennal scapes about three times as long as broad, funicular joints all distinctly longer than broad, cylindrical, very gradually increasing in length to the tip. Thorax narrow and long, flattened above, peculiarly and deeply excavated on the ventral side behind the insertions of the fore coxæ; mesosterna swollen. Epinotum resembling that of the female. Petiole and postpetiole much as in the worker, but the former subpedunculate, merging more gradually into the node, without a tooth on its ventral surface. Gaster long and slender. Fore wing with a single cubital cell.

Smooth and shining; hairs and pubescence much as in the worker but less abundant and more delicate.

Color pale yellow of a distinctly lighter tint than in the worker and female. Wings grayish hyaline, with pale brown veins and pterostigma.

Described from numerous specimens of all the phases belonging to a series of several hundred specimens taken at Medje from the hollow stems of *Vitex Staudtii* Guerke. The relations of the ant to the plant are described in Dr. Bequaert's notes in Part IV, and Prof. Bailey has described the woody structure of the plant and its modification by the ants in Part V.

Stitz described and figured only the worker of this species from specimens taken by Tessmann in Spanish Guinea. He gives the native Pangwe name as "odschigeso" and says that the insect stings more severely than *Pachysima æthiops*, which is a much larger and more powerful ant. He also describes one of the ergatoid females but seems to regard it as an unusual worker. In my material about 4 to 5 per cent of the specimens are ergatoid females, so that they must form a normal constituent of the colony. They probably function as egg-laying individuals and thus supplement the reproductive activities of the true females, which, judging from my material, are much less numerous.

The adult specimens of *V. tessmanni* collected by Mr. Lang are accompanied by numerous eggs, larvæ, and pupæ in all stages. I have figured the adult larva (Fig. 24) because it is interesting in connection with the extraordinay larvæ of the two species of *Pachysima* described below. It resembles the larva of *Tetraponera natalensis* figured by Emery,[1] but is longer and more slender and two of the postcephalic

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[1] 1899, Mem. Accad. Sc. Bologna, (5) VIII, Pl. II, fig. 7.

segments bear appendages, the significance of which is more fully explained in my remarks on *Pachysima*. The prothoracic segment bears a rounded appendage on each side and applied to the side of the head, which, as in the *Tetraponera* larvæ, is overarched by the protuberant, cowl-like prothoracic segment. The first abdominal segment bears ventrally two large and very protuberant appendages which are fused with each other in the middle line. The anterior segments of the body have on their dorsal surfaces clusters of long hooked hairs, as in *T. natalensis*, and the more posterior segments have simple stiff hairs of very unequal length on their ventral surfaces. There are also numerous short, sparse hairs, scattered over the whole body. The young larvæ are essentially like the oldest in form and pilosity. The mandibles are well chitinized and minutely bidentate at the tip as in *natalensis*, and the head bears minute rudiments of antennæ on its dorsal surface. I find also that the larvæ of certain East Indian *Tetraponeræ*, e.g., *T. allaborans* (Walker), have a similar structure.

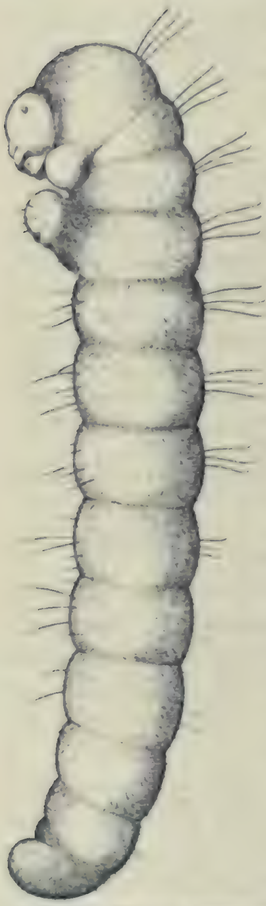


Fig. 24. *Viticicola tessmanni* (Stitz). Adult larva in profile.

Viticicola tessmanni variety **castanea**, new variety

Worker and Female (deälated).—In all respects like the typical form except in the color of the body and legs, which are pale chestnut brown, with the antennæ paler and more yellowish.

Of this variety Mr. Lang took numerous workers and females from two colonies at Avakubi. They were nesting in the same species of liana as the typical form.

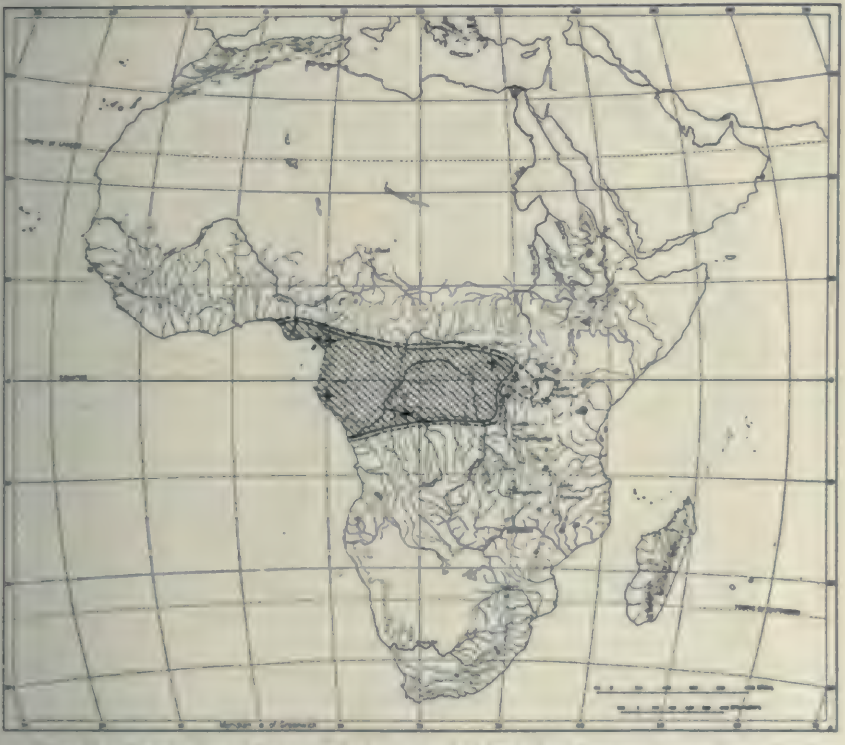
PACHYSIMA Emery

Worker.—Closely related to *Tetraponera* but larger and more robust, with smaller eyes but distinct ocelli and the frontal carinæ decidedly longer and farther apart. Maxillary palpi 5-jointed; labial palpi 4-jointed. Both the petiole and postpetiole armed beneath with stout teeth. Claws toothed as in *Tetraponera*.

Female.—Much like the worker. Wings very long, with venation like that of *Tetraponera;* radial cell long and narrow.

MALE.—Resembling the female and with very similar wings. Antennæ 12-jointed; scapes only a little longer than the second funicular joint; first funicular joint not swollen, much shorter than the second. Mesonotum without Mayrian furrows. Pro- and mesosterna not separated by a deep concavity. Petiole and postpetiole not dentate beneath. External genital valves large and stout, strongly geniculate, with inturned points.

LARVA without hooked dorsal hairs; the exudatoria on the three thoracic segments and first abdominal segment in the youngest stage (trophidium) long and digitiform.



Map 19. Distribution of the genus *Pachysima* and its host plant *Barteria*: crossed area, distribution of *P. æthiops* (F. Smith); crosses, known localities of *P. latifrons* (Emery); heavy interrupted line, limits of the range of the genus *Barteria*.

This genus comprises only two known species and was originally described by Emery as a subgenus. It is confined to West Central Africa (Map 19), its limited range being due to the fact that it lives in the hollow stems of *Barteria*, a genus of plants confined to the area marked on the accompanying map.

Pachysima æthiops (Smith)

Text Figures 25, 26, and 27

Avakubi, ☿, ♂; Stanleyville, ♀; Ambelokudi, ☿; Isangi, ☿; Panga, ♀; Medje, ☿, ♀, ♂; Bafwabaka, ♀ (Lang and Chapin).

This shining, jet-black ant, the worker of which measures 9 to 10 mm., the male and female 13 to 14 mm., is the largest, most widely distributed, and therefore best known to taxonomists of all the Ethiopian species formerly included in the genus *Sima*. It is represented in the collection by numerous adults and larvæ and pupæ in all stages. The specimens from Medje and Ambelokudi were living in the twigs of *Barteria fistulosa* (Plates XXVIII and XXIX). "When disturbed the workers came out in great numbers. The natives, who call them 'guma-guma,' fear them on account of their sting."

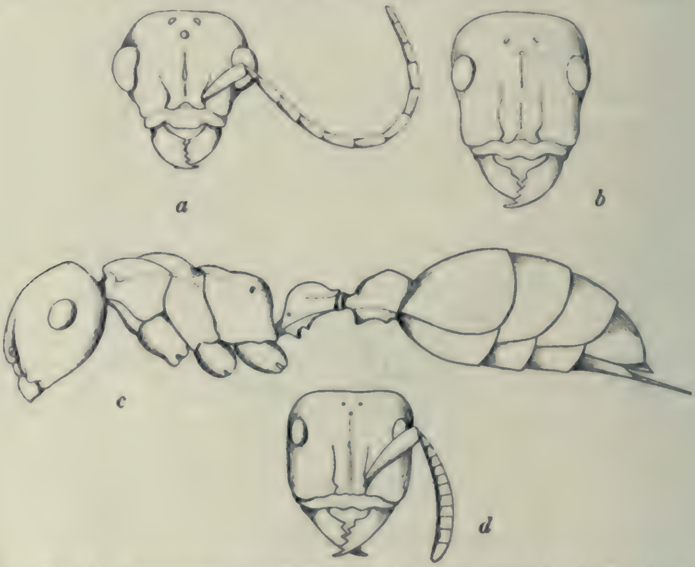


Fig. 25. *Pachysima æthiops* (F. Smith). *a*, head of male; *b*, head of female; *c*, body of worker in profile; *d*, head of same from above.

Referring to specimens taken by Tessmann in Spanish Guinea and the Cameroon, Stitz says that "this ant is often found on the trunks of *Epitaberna myrmœcia* K. Schum., the thickened twigs of which it inhabits. It is called 'engunkun' by the natives and its sting is greatly feared as it is supposed to cause fever."

Father Kohl (1909, Natur u. Offenbarung, LV, p. 97, *et seq.*) gives a much more extensive account of the habits of *P. æthiops* and especially of the plant *Barteria fistulosa* which it inhabits. According to his observations in the Congo, it is restricted to this plant and an allied species, *B. Dewevrei* De Wildeman and Th. Durand. It inhabits the peculiarly swollen, lateral branches and keeps large coccids in their cavities. The openings to the cavities are not made at definite points predetermined by a peculiar histological structure, as in the case of the Neotropical *Cecropiæ* associated with species of *Azteca*. After the marriage flight the *æthiops* queen gnaws its way into an already hollow twig and while she is establishing her colony the orifice, as in *Cecropia*, closes by growth of the plant tissue, so that it has to be reopened from within by the workers of the young colony. As several queens enter different internodes of the same plant, their various colonies probably eventually unite to form a single huge colony possessing all the cavities in common, as in the case of *Cecropiæ* tenanted by *Azteca*. Concerning the behavior of *æthiops*, Kohl writes as follow:

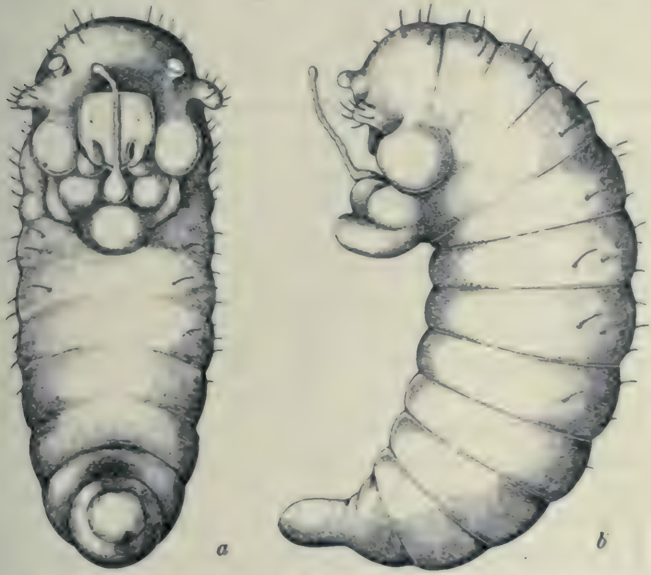


Fig. 26. ***Pachysima æthiops*** **(F. Smith). First stage larva or trophidium. *a*, ventral; *b*, lateral view.**

> The *Simæ* are extremely pugnacious and always ready for a fight as they are equipped with excellent weapons, their stings and mandibles. If a *Barteria* tree is roughly handled or even shaken, innumerable hosts of the ants rush out of all the openings and woe to him who approaches them too closely! I have had many sore experiences with their pointed stings while studying or amputating the branches.

The pain spreads instantly over the whole affected limb and continues for a long time and on the following morning returns with full intensity during one's ablutions. One day my black servant told me that it was customary in his part of the country to punish unfaithful wives by tying them to plants inhabited by the *Sima*.

On examining the series of *æthiops* larvæ, I was struck with their extraordinary appearance. A further study of them and of the larvæ of the only other known species of *Pachysima* (*P. latifrons*) throws considerable light on the raison d'être of the peculiar ethological relations of larval ants to their nurses, as I have shown in a recent paper.[1]

Four distinct stages, probably separated by moults or ecdyses, may be recognized in the *æthiops* larva. The first stage larva, just after hatching, is represented in Fig. 26*a-b* as it appears in ventral and lateral view. The body is curved, convex dorsally and concave ventrally, and terminates behind in a cylindrical projection, with the anus shifted to the ventral surface near its base. The creature is strongly hypocephalic like the larvæ of *Tetraponera* , *Viticicola*, and *Pseudomyrma*, i. e., with the head on the ventral side. The head is surrounded by a cluster of prominent, tubercle-like appendages. On the prothorax, which is large and forms a hood over the head, there are three pairs of these appendages, an anterior truncate pair, a median pointed pair and a large posterior pair, which are swollen and rounded and embrace the sides of the head. These correspond to the single prothoracic pair figured in the larva of *Viticicola tessmanni*. The mesothoracic segment has a pair of smaller appendages nearer the midventral line. Between them arises a very peculiar organ, with a swollen, pear-shaped base prolonged into a slender, apparently erectile, tentacle-like process which extends up in front of the head and terminates in a small ampulla. The first abdominal segment bears a pair of large swollen appendages, which lie at the lateral bases of the mesothoracic pair and are united with a large and very prominent midventral tubercle. This tubercle and its lateral appendages are represented in the larva of *V. tessmanni* but the others, with the exception of the third thoracic pair, are absent. Sections and stained, cleared preparations of the whole larva show that the various tubercles contain portions of the fat-body, at least in the basal portions of their cavities, and next to the hypodermis a dense, granular substance, evidently a coagulated liquid produced by the adipocytes or trophocytes. The liquid also fills the impaired tentacle, except its pear-shaped base, which contains fat-cells. Around the bases of the tubercles are muscles so arranged that their contraction increases the pressure of the fat and granular

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[1] 1918. 'A study of some ant larvæ, with a consideration of the origin and meaning of the social habit among insects.' Proc. Amer. Phil. Soc., LVII, pp. 293–243, 12 figs.

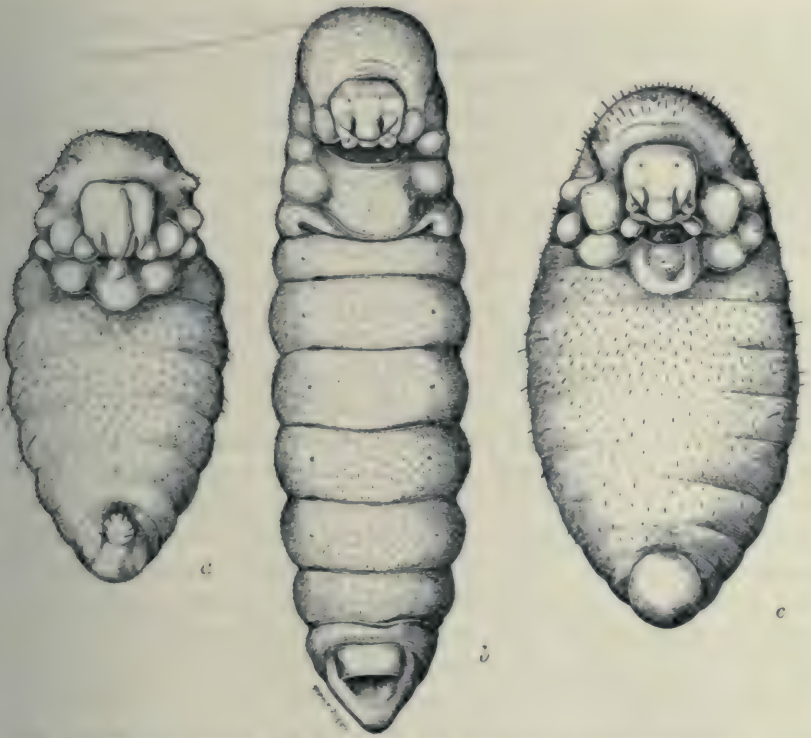

Fig. 27. *Pachysima æthiops* (F. Smith). *a*, second stage larva; *b*, third stage larva; *c*, fourth stage or adult larva.

liquid on the appendages and in all probability causes the liquid to exude through the hypodermis and delicate chitinous cuticle onto the surface. The whole arrangement of the tubercles, in fact, constitutes a system of exudate organs or "exudatoria," as I shall call them, adapted to produce a substance that can be licked up by the ants when they are feeding and caring for the larvæ. In this stage the mandibles are small, soft, and unchitinized, so that the ants must feed the larva by regurgitation on liquid food. The labium of the larva has a peculiar pair of swollen appendages, shown just beneath the mandibles in the figure. The body is naked, except for a few sparse, pointed bristles on the dorsal surface and the median pair of prothoracic appendages. As nothing like this larval stage is known among ants or indeed among the Hymenoptera, I propose to call it the "trophidium."

The second stage larva is shown in Fig. 27*a*. The various exudatoria are small in proportion to the remainder of the body but are still much like those of the trophidium. The body is more elliptical, the mandibles are more pointed and distinctly falcate but, even in this stage, they are unchitinized and therefore nonfunctional. The coarse hairs are visible on the dorsal surface but a more uniform investment of small hairs has made its appearance. They are blunt or even clavate, especially on the prothoracic segment. In this and the trophidium stage, I am unable to find any salivary glands in cleared preparations, though rudiments of these organs may, perhaps, be present.

The third stage larva (Fig. 27*b*) is larger and very regularly elliptical. The exudatoria can all be recognized, except the impaired tentacle. It is, however, present in some of the younger individuals but in a greatly reduced and vestigial condition at the bottom of the deep depression which now forms a definite pocket just back of the mouth and under the midventral swelling of the first abdominal segment. In many larvæ I found in this pocket a small rounded, dark-colored pellet which puzzled me at first. In sections it was at once seen to consist of triturated and compacted bodies and parts of small insects. It is, in fact, a food-pellet placed by the worker ants in the pocket just behind the larva's mouth and proves to be merely the pellet which is originally formed in the infrabuccal pocket of the adult ants. In this stage, therefore, the larva is fed on solid food and the strongly chitinized, acute, and bidentate mandibles corroborate this statement. Slender salivary glands may also be detected in this stage indicating that the substance of the food-pellet is subjected to extra-intestinal digestion. The longer hairs on the dorsal integument have almost completely disappeared. The first pair of appendages on the prothorax have disappeared and the second pair is smaller or obsolescent.

In the fourth or adult stage (Fig. 27*c*) the larva is more elongate and cylindrical and much more hypocephalic, the prothorax forming a great protuberance in front of the head. The exudatoria are still recognizable, with the exception of the first and second prothoracic pairs, which have disappeared completely. The labial appendages are reduced. A food-pellet was found in the postcephalic pocket in several of the larvæ of this stage but is not represented in the figure. The coarse hairs have disappeared from the integument, which is now uniformly covered with very short, delicate hairs and the structure of the posterior end of the body is very different from that of the preceding stages.

The conclusions which I draw from the study of these larvæ and from those of *P. latifrons* and *Pædalgus infimus* (*vide infra*) are that the young larvæ are fed by regurgitation, the older larvæ with pellets of crushed insects, and that, especially during their younger stages, the larvæ are so assiduously fed and cared for because they furnish liquid exudates, small in quantity, to be sure, but of such a quality as to excite the appetite of their nurses and induce regurgitation. I believe that the salivary glands, as soon as they develop, take on the function of supplying exudates and at the same time aid in the extra-intestinal digestion of the food placed in the postcephalic pocket. That the salivary glands may be important as exudate organs throughout life is indicated by certain genera of Myrmicinæ (e. g., *Pædalgus*), the larvæ of which have no exudatoria but greatly developed salivary glands, though the latter are never used for spinning cocoons in the prepupal stage. Thus in ants very much the same "œcotrophobiotic" relations exist between the adults and young as Roubaud[1] has so beautifully described for the wasps of the genera *Belonogaster*, *Ropalidia* (=*Icaria*), and *Polistes*. To these relations, established by a mutual exchange of food-substances and which I have called "trophallactic," the social life of ants in all probability owes its origin, development, and maintenance. Moreover, the exudates of larval ants are strictly comparable with those of various castes of termites among themselves, of the queens of parasitic ants and even of workers (e. g., *Crematogaster inflata* of the East Indies), with the excrement of coccids and aphids, the secretions of lycænid larvæ and the nectar of the extrafloral nectaries of plants. Thus trophallaxis, myrmecophily, termitophily, trophobiosis, and the relations of ants with certain plants (myrmecophytes) are all seen to be merely so many particular manifestations of the same fundamental instinct of ants to foster and defend and, if possible, to feed and transport any small living object which can furnish droplets of agreeable secretion or exudates.

The only account of the *æthiops* larva in the literature is by Emery.[2] He describes the adult larva very briefly and figures its anterior end with some of the exudatoria but erroneously interprets the large prothoracic pair as "ébauches de pattes," or rudiments of the anterior pair of imaginal legs.

In the same paper Emery created the subgenus *Pachysima* for the accommodation of *æthiops* and *latifrons*, because those species have the frontal carinæ of the worker and female much more widely separated than the numerous other species of *Tetraponera* (=*Sima*). I have raised *Pachysima* to generic rank, because the larvæ of the two species are so very different from those of *Tetraponera*.

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[1] 1916. 'Recherches biologiques sur les guêpes solitaires et sociales d'Afrique.' Ann. Sc. Nat. Zool., (10) I, pp. 1–160.

[2] 1912, Ann. Soc. Ent. Belgique, LVI, p. 97.

Pachysima latifrons (Emery)

Text Figures 28, 29, 30, and 31

Worker.—Length 7 to 8.5 mm. Similar to the worker of *P. æthiops* but smaller, smoother and more shining, and much more finely punctate, with the frontal carinæ somewhat farther apart and more nearly parallel. The mandibles have less oblique apical borders and are smooth and shining and sparsely punctate, not coarsely striated as in *æthiops;* the mesonotum is shorter and semicircular; the epinotum in profile somewhat lower and more rounded; the petiole bears on its ventral surface a single large acute, backwardly directed spine, instead of two spines, and the postpetiole has in the same relative position a smaller spine of similar shape, representing the larger, blunter projection of *æthiops*. The erect hairs and pubescence on the body are distinctly more abundant in *latifrons*, and the clypeus has a conspicuous fringe of yellow ciliary bristles, which are not developed in *æthiops*, and the antennal scapes have a row of long scattered hairs on their anterior surfaces. There is no difference in coloration.

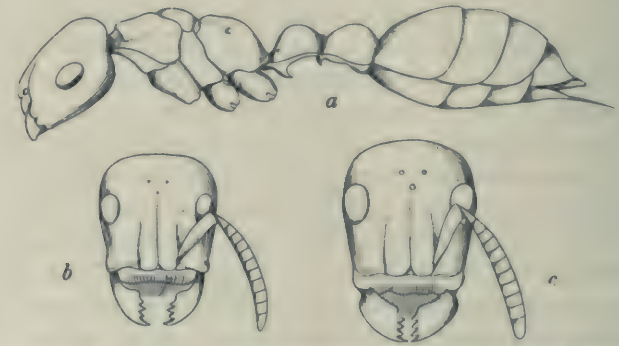

Fig. 28. *Pachysima latifrons* (Emery). *a*, body of worker in profile; *b*, head of worker from above; *c*, head of female.

Female.—Length nearly 12 mm. Closely resembling the worker and differing by the same characters from the female of *æthiops*. The head and thorax are more slender than in the latter species and the petiolar and postpetiolar nodes are narrower and less submarginate on the sides. The pilosity and pubescence are much less developed on the body than in the worker, though the clypeus has conspicuous yellow ciliary bristles and the antennal scapes have a few long hairs along their anterior surfaces. The wings are blackened like those of *æthiops*.

Described from numerous workers and a single female taken from a colony at Niangara (Lang and Chapin), also in hollow twigs of a *Barteria*, presumably *B. fistulosa*. This species appears to be confined to western Africa; its distribution is still imperfectly known.

The larval stages are quite as remarkable as those of *P. æthiops* and exhibit four stages as follows.

The trophidium, or first stage larva, shown in Fig. 29*a-b*, is very hypocephalic, the prothoracic segment being greatly enlarged and projecting anteriorly. Stained preparations *in toto* and sections show that the portion of the fat-body in this segment is heavily charged with urate crystals, so that it undoubtedly functions as a storage kidney till the Malpighian vessels are sufficiently developed to excrete. The first and second pairs of prothoracic appendages of the *æthiops* larva are absent, but the third pair is very large and embraces the sides of the head. The meso- and metathoracic segments each bear a pair of slender, pointed appendages, the first abdominal segment a huge leg-like pair which are swollen and fusiform at the base and running out into a slender process which forms an obtuse angle with the basal portion. The sternal region between these appendages is protuberant and its cuticular covering, like that of the four pairs of appendages, is minutely prickly, unlike the smooth cuticle of the remainder of the body. Sections show that both the four pairs of appendages and the sternal swelling are exudate organs, though the prothoracic and abdominal pairs are evidently much more important than the others. The prothoracic appendages are filled with blood and very little fat-tissue, but their hypodermis is much thickened

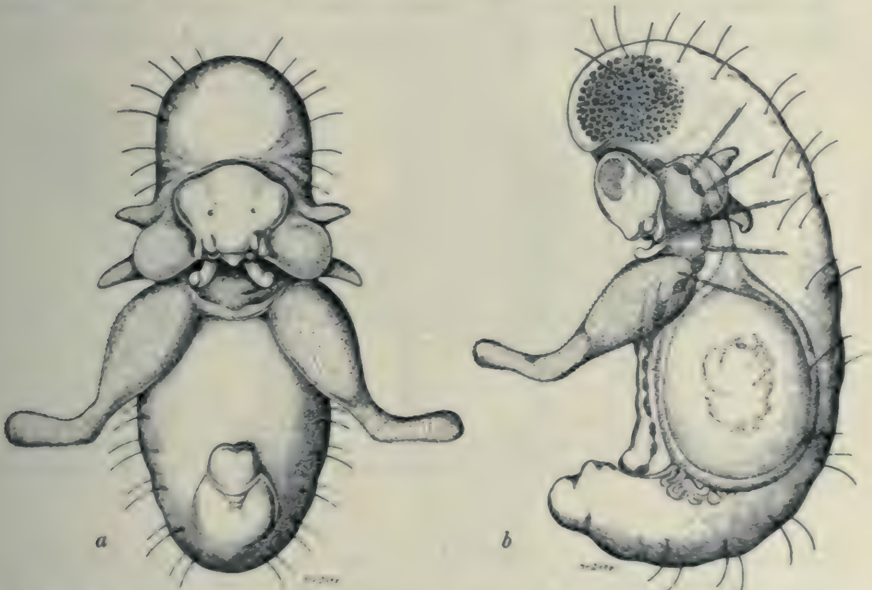

Fig. 29. *Pachysima latifrons* (Emery). First larval stage or trophidium. *a*, ventral; *b*, lateral view.

and consists of crowded cells arranged in peculiar clusters. In section, the abdominal appendages appear as in Fig. 30. The fusiform base is filled with large, clear trophocytes, or fat-cells, some of which in the middle of the swelling may be filled with urate crystals, like those in the prothoracic storage kidney, but the slender, tubular distal portion contains a granular liquid which can only be regarded as an exudate derived from the trophocytes in the basal enlargement. This exudate is evidently filtered through the thin cuticle covering the appendage by pressure, for there is a rather elaborate system of muscles, as in the *æthiops* larva, surrounding the bases of the appendages and capable of subjecting their contents to pressure. The head is small and has soft, blunt, rudimentary and unchitinized mandibles and the labium bears a pair of long, palp-like appendages, which project forward in the deep depression between the head and the swollen sternal portion of the first abdominal segment. These are probably also exudatoria and seem roughly to correspond to the unpaired tentacle of the *æthiops* larva. The structure of the mouth-parts shows that the larva in this stage is fed with liquid food regurgitated by the workers. The convex dorsal surface is beset with sparse, curved bristles of uniform thickness, with blunt tips. The segmentation of the body is indistinct and its posterior end curves forward and terminates in a large tubercle with the anal orifice just anterior to its base. The Malpighian vessels have only just begun to develop at the blind end of the proctenteron where it abuts on the posterior end of the large, elliptical mesenteron, or stomach, but no salivary glands can be detected.

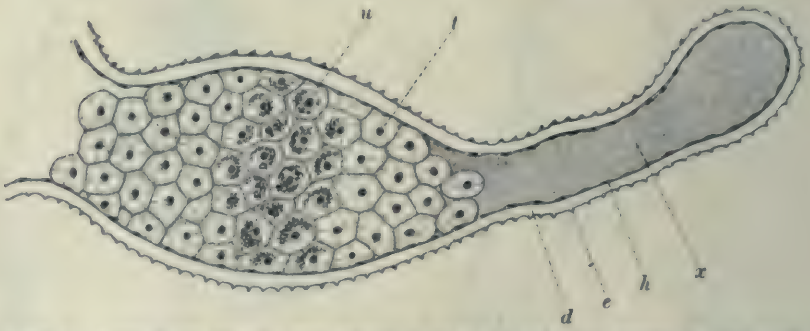

Fig. 30. Longitudinal section through exudatorium of first abdominal segment of trophidium of *Pachysima latifrons* (Emery): *t*, trophocytes or fat-cells of the fusiform base, some of them in the middle with urate crystals (*u*); *x*, granular liquid or exudate filling the distal portion; *d*, dermis; *e*, epidermis; *h*, hypodermis.

In the second stage larva (Fig. 31*a*) the body is more elongate and cylindrical and the four pairs of appendages can still be recognized though considerably smaller in proportion to the remainder of the body. The mandibles are becoming chitinized. Many of the long hairs on the dorsal surface are still present, but a general covering of short, sparse hairs has made its appearance.

The third stage larva (Fig. 31*b*) is larger and still more elongate and cylindrical and shows a further regressive development of the exudatoria. Those on the meso- and metathoracic segments have disappeared and the abdominal pair has short broad bases with the distal portions attenuated to slender points. The labial appendages have also disappeared. The mandibles are well developed and chitinized, and the larva is now fed with pellets of crushed insects, like the *æthiops* larva in the corresponding stage. These pellets were found still *in situ* in several of the alcoholic specimens as represented in the figure (Fig. 31*b*). The pellet lies in the deep pocket between the head and the sternal protuberance of the first abdominal segment and is, therefore, within easy reach of the

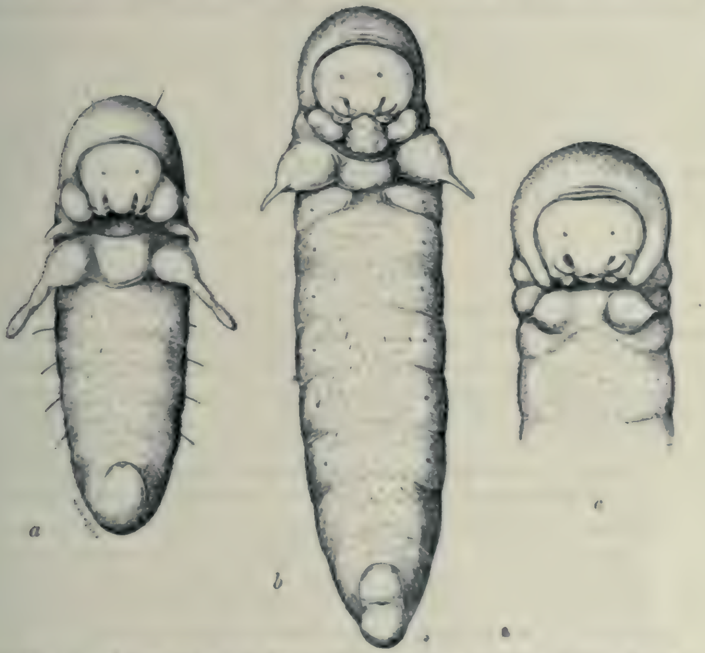

Fig. 31. *Pachysima latifrons* (Emery). *a*, second stage larva; *b*, third stage larva; *c*, anterior half of fourth, or adult, larval stage.

mandibles and labium of the larva. Cleared preparations show that the salivary glands have made their appearance, though they are small and slender.

The anterior end of a fourth stage or adult larva is shown in Fig. 31*c*. The exudatoria of the prothoracic segment now appear merely as a pair of welts or folds embracing the sides of the head and continuous with the more dorsal portions of their segment, which is relatively smaller and less projecting than in the preceding stages. The appendages of the first abdominal segment are still distinct but their distal portions are reduced to mere points, sometimes absent in larvæ just before pupation, and the sternal swelling is much less prominent. In this stage the larva resembles that of *Tetraponera* throughout its various stages. In the third and fourth stages of the *latifrons* larva, as in the corresponding stages of *æthiops*, the salivary glands probably furnish secretions which are useful both in the extra-intestinal digestion of the food-pellet and as exudates that can be imbibed by the workers.

Myrmicinæ

WORKER monomorphic, dimorphic, or polymorphic, often very strongly so; the soldier form having a very large head and strong mandibles. Frontal carinæ nearly always separated, rarely close together; divergent or slightly convergent behind and rarely lobed anteriorly; usually the clypeus is wedged in between the frontal carinæ; in the Metaponini and a few other forms the clypeus is not prolonged back, its posterior margin being rounded. Antennæ from 4- to 12-jointed, often with a distinct club. Ocelli frequently absent in the ordinary worker, though in strongly dimorphic species they may still be more or less distinct in the soldier. Pedicel formed by the petiole and the postpetiole; very rarely (*Melissotarsus*) the postpetiole is nearly as wide as the basal segment of the gaster. Stridulatory organ usually present at the base of the gaster. Sting developed. Spurs of the middle and hind tibiæ in the majority of cases simple or absent; pectinate in the Metaponini and Myrmicini only. Gizzard simple and tubular in most genera and of a very primitive type compared with the conditions in the Dolichoderinæ, Camponotinæ, and Pseudomyrminæ.

FEMALE usually winged and larger than the worker; in a few cases ergatoid; true dichthadiiform queens are not known, but in some parasitic genera (*Anergates*, *Anergatides*) the gaster of the fertile female becomes enormously distended.

MALE usually with the copulatory armature partly exserted; entirely retractile in a few genera of the Solenopsidini only. Anal segment with cerci. In a few cases (as in certain species of *Cardiocondyla*) ergatoid, wingless males are known, sometimes together with winged individuals. Antennæ almost always 13-jointed, even when the worker and female have very few antennal joints (11-jointed in *Stereomyrmex* and *Cataulacus;* 12-jointed in *Metapone*, certain Attini, Meranoplini, etc.).

The venation of the fore wing offers much diversity. In some genera the more primitive type is still retained, with a closed radial, two closed cubital cells, and a closed discoidal cell, but all degrees of reduction are met with. When there is only one cubital cell, the cubitus may be united with the radius by means of a long intercubitus (type of *Solenopsis*) or the intercubitus may disappear, the cubitus and radius being fused in a spot or for some distance (type of *Formica*).

LARVA thick-bodied, orthocephalic, without exudatory papillæ around the mouth. The body is, as a rule, abundantly covered with chitinous hairs of very different kinds; dorsal oncochætæ often present.

NYMPHS never enclosed in a cocoon.

The Myrmicinæ is the largest subfamily of ants, containing over 120 genera and many thousands of described species, races, and varieties, nearly as many as the other six subfamilies together. As would be expected, the taxonomic arrangement of this maze is exceedingly difficult and it is no wonder that such keen myrmecologists as Forel and Emery have not yet succeeded in reaching satisfactory results and are obliged to modify their views at every turn of the road. For practical and other reasons, have felt at liberty to change somewhat the classification proposed by Emery,[1] though have followed him in the main. Have united the two tribes Solenopsidini and Pheidologetini, which pass repeatedly into each other and are merely separated by the shape of the radial cell (closed in the Pheidologetini; open in the Solenopsidini), a character the value of which seems to have been overrated by Emery. Have also accepted Forel's tribe Proattini and, furthermore, separated *Stegomyrmex* from the Dacetini as an independent tribe. The very peculiar genus *Archæomyrmex*, recently discovered by Mann in the Fiji Islands, must also constitute a distinct tribe, which I have provisionally placed between the Myrmecinini and Meranoplini.

The habits in this subfamily offer no less diversity than the structure. The majority of the species are carnivorous or partly so; but many others are granivorous, the most prominent in this respect being the members of *Messor* and allied genera (*Novomessor*, *Veromessor*, *Oxyopomyrmex*, *Pogonomyrmex*, many species of *Pheidole*, etc.). In these ants the nest often contains spacious granaries full of seeds. Many myrmicine ants are attracted by sugary substances such as are furnished by the nectaries of flowers or various extrafloral plant organs. Often, also, they attend aphids, coccids, psyllids, or leafhoppers for the sake of the honeydew they excrete. The New World "leaf-cutting" or "fungus-growing" ants of the tribe Attini feed exclusively on the food-bodies ("bromatia") produced by fungi cultivated in their nests. There are also many cases of social parasitism which, in its most extreme form, has lead to the disappearance of the worker caste (*Wheeleriella*, *Epixenus*, *Epipheidole*, *Sympheidole*, *Epœcus*, *Anergates*, *Anergatides*, and probably several other genera of which only males and females are known). Temporary social parasitism is probably the rule in some species of *Aphænogaster* and in the Malagasy and Indomalayan subgenus *Oxygyne* of *Crematogaster*.

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[1] Emery, C. 'Intorno alla classificazione dei Myrmicinæ,' Rend. Accad. Sc. Bologna, 1914, pp. 29–42. 'Noms de sous-genres et de genres proposés pour la sous-famille des Myrmicinæ; modifications à la classification de ce groupe,' Bull. Soc. Ent. France, 1915, pp. 189–192.

PHEIDOLE Westwood

Small ants with the worker strongly dimorphic, the two forms being designated as the worker and soldier. In a few species these phases are connected by intermediates (mediæ).

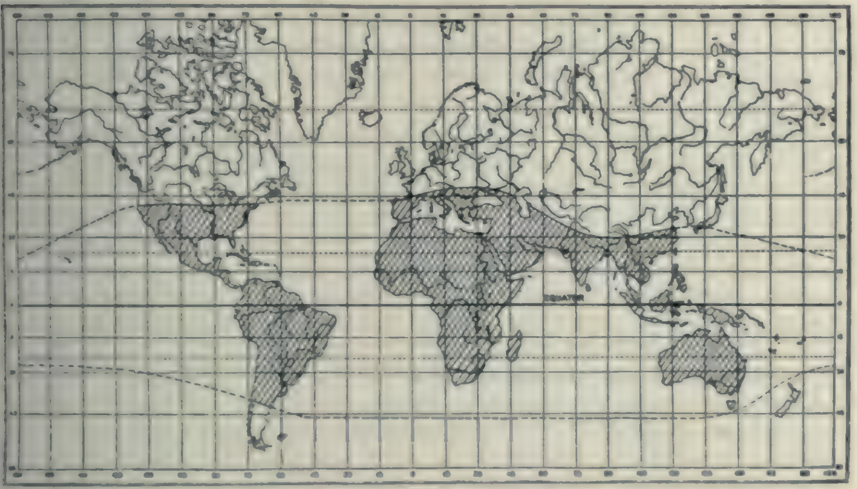
SOLDIER with very large head, subrectangular or subcordate, more or less deeply notched or excised behind and with a distinct occipital furrow, on each side of which the occipital region is convex. Clypeus short, depressed, carinate or ecarinate but not elevated in the middle, the anterior border entire or notched in the middle, the posterior border extending back between the frontal carinæ, which vary in length, being short in some species and in others greatly prolonged backward and forming the inner borders of more or less distinct scrobes for the antennæ. Frontal area usually distinct, deeply impressed. Mandibles large, convex, usually with two apical and two basal teeth, separated by a toothless diastema. Antennæ 12-jointed; the funiculus with long first joint; joints 2 to 8 small and narrow; the three terminal joints forming a well-developed club. Thorax small, usually with distinct promesonotal and mesoëpinotal sutures and pronounced mesoëpinotal constriction; the pro- and mesonotum raised, more or less convex, the humeri sometimes prominent, the mesonotum often with a transverse welt or torus; the metanotum sometimes represented by a distinct sclerite; the epinotum armed with spines or teeth, in profile with distinct basal and declivous outline. Petiole small and narrow, pedunculate anteriorly, the node posterior, compressed anteroposteriorly, its superior border sometimes emarginate, the ventral surface unarmed. Postpetiole broader than the petiole, convex and rounded above, contracted behind, the sides often produced as angles or conules, more rarely as spines. Gaster rather small, broadly elliptical or subcircular. Femora more or less thickened in the middle; middle and hind tibiæ without spurs; tarsal claws simple.

WORKER smaller than the soldier but very similar in the structure of the thorax, pedicel, and gaster; the head, however, much smaller, not grooved nor deeply excised posteriorly; the antennæ longer; the mandibles less convex, with evenly denticulate apical borders. The pro- and mesonotum are proportionally less convex, and the petiole and postpetiole are more slender.

FEMALE resembling the soldier but larger; the head proportionally smaller and shorter, usually not longer than broad and not broader than the thorax; the occiput only broadly and feebly excised. Thorax broad and massive; the mesonotum flat, overarching the pronotum in front. Epinotal spines shorter and stouter; petiole and postpetiole more massive; gaster much larger and more elongate than in the soldier. Wings long, with a discoidal cell, two closed cubital cells, and an open radial cell.

MALE decidedly smaller and more slender than the female, the head small, with large, convex eyes and ocelli; mandibles small but dentate. Clypeus longer than in the soldier. Antennæ 13-jointed; the scapes very short, scarcely longer than the second funicular joint, first joint subglobular. Thorax broad; the mesonotum flattened, without Mayrian furrows, anteriorly overarching the small pronotum; epinotum unarmed. Petiole and postpetiole slender, with low nodes. Gaster slender, elongate. Genital appendages small. Cerci present. Legs long and slender. Wing venation as in the female.

The species of this very large and difficult genus are distributed over the tropics and warmer temperate areas of both hemispheres (Map 20). In the Nearctic Region the northernmost range is southern New England and Oregon; in the Palearctic, Japan and northern Italy; in the southern hemisphere it reaches Argentina and Tasmania. Emery has divided the genus into a number of subgenera and has rejected a couple of subgenera, *Allopheidole* and *Cardiopheidole*, described by Forel and myself. The various groups have been characterized by Emery in a recently published portion of the 'Genera Insectorum' on the Myrmicinæ.



Map 20. Distribution of the genus *Pheidole*.

Nearly all the species of *Pheidole* nest in the ground, either under stones and logs or in crater or small mound nests. Many species feed exclusively on insects and often have a peculiar fecal odor precisely like that of the Dorylinæ, which also have an insect diet; but many species are harvesters and store the chambers of their nests with the seeds of small herbaceous plants. This is especially true of the desert species of *Pheidole*. In some species in Australia and the southern United States, the soldiers take on the function of repletes and store in their crops sweet liquid for the use of the colony during periods of food and water scarcity. One species, *Pheidole megacephala*, has been carried to all parts of the tropics and has become a great pest in and about dwellings and plantations as it assiduously cultivates coccids on many economic plants and ruthlessly destroys and replaces the native ant-faunas. This has been observed in the Madeira Islands, Hawaii, Australia, and the West Indies. In all probability *P. megacephala* is of Ethiopian or Malagasy origin, as it shows a great development of subspecies and varieties in these two regions and nowhere else.

Pheidole batrachorum, new species

SOLDIER.—

Length 4.5 to 5 mm.

Allied to *P. caffra* Emery. Head a little longer than broad, scarcely narrowed in front, with straight sides and deeply excised posterior border, the vertex convex, the occipital region distinctly depressed, the occipital and frontal groove shallow. Eyes small, broadly elliptical, rather flat, at the anterior third of the sides of the head. Mandibles convex with bluntly bidentate tips. Clypeus flat, carinate, its anterior border notched in the middle. Frontal area small, subtriangular, deeply impressed, without median carinula. Frontal carinæ not strongly diverging behind, prolonged backward as a pair of rugæ to the posterior fifth of the head and forming the inner borders of flat, scrobe-like impressions for the antennæ. The latter slender, their scapes distinctly flattened but not dilated at the base, extending to nearly half the distance between the eyes and the posterior corners of the head; club shorter than the remainder of the funiculus; joints 2 to 8 distinctly longer than broad. Pro- and mesonotum not separated by a suture, convex; humeri prominent; mesonotum with strong transverse torus; mesoëpinotal constriction very sharp and deep; epinotum broader than long, its base straight and horizontal, as long as the declivity, dorsally with a broad longitudinal groove; the spines acute, stout at the base, as long as the base of the epinotum and as long as their distance apart, directed upward and somewhat backward and distinctly curved downward Petiole twice as long as broad, scarcely broader behind than in front, with nearly straight sides; in profile with long, feebly concave anterior and short, vertical posterior surface to the node, the superior border transverse, sharp and feebly emarginate. Postpetiole nearly three times as broad as the petiole, broader than long, very convex and rounded above, the sides bluntly angular in the middle. Gaster smaller than the head, subcircular, its anterior border slightly truncated, the dorsal surface somewhat depressed. Legs long, femora thickened in the middle.

Subopaque; mandibles, clypeus, frontal area, and posterior half of gaster smooth and shining. Mandibles coarsely and sparsely punctate; coarsely rugose at the base. Clypeus very finely rugulose, especially on the sides. Head densely and finely, but not deeply punctate, longitudinally rugose, the rugæ being rather widely separated and subsiding on the posterior fifth of the head; the posterior fourth also with a few large, shallow, elongate foveolæ. Thorax, pedicel, and anterior half of gaster more opaque than the head, finely and densely punctate; the pronotum also finely and rather asymmetrically transversely rugulose. Mesoëpinotal constriction with sharp longitudinal carinulæ or rugæ; declivity of epinotum transversely rugose above. Basal half of gaster with sparse, elongate, piligerous elevations. Legs smooth and shining.

Hairs coarse, pointed, fulvous, long, and erect, lacking on the thorax and sides of head, sparse on the pedicel and gaster and front of head; short and closely appressed on the legs and antennæ.

Deep piceous, almost black; mandibles, clypeus, cheeks, and appendages castaneous; the funiculi, tips of scapes, tibiæ, tarsi, and articulations of the legs paler and more reddish.

WORKER.—

Length 3 to 3.5 mm.

Head (without the mandibles) nearly circular, the occipital border strongly marginate. Eyes rather small but convex, just in front of the middle of the sides of the head. Mandibles long, deflected, their external borders concave, their tips with two prominent teeth, the remainder of the apical border finely denticulate. Antennæ long and slender, the scapes extending fully one-third their length beyond the occipital border of the head. Clypeus rather flat in the middle, ecarinate, its anterior border entire and broadly rounded. Thorax resembling that of the soldier, but the humeri not prominent, the torus of the mesonotum is feebler, the epinotal spines are more slender, and distinctly shorter than the base of the epinotum and more curved than in the soldier. Petiole more slender, the node lower, more conical, its superior border not emarginate, scarcely more than twice as long as broad. Postpetiole campanulate, as long as broad, broader behind than in front. Gaster elongate elliptical, with truncated anterior border, its dorsal surface convex. Legs long and slender.

Shining; mandibles very finely and densely striolate. Clypeus, head, thorax, and pedicel densely punctate or reticulate; the head somewhat smoother and more shining in the middle anteriorly; the sides of the pronotum smooth and polished; cheeks and sides of front with a few longitudinal rugules. Base of first gastric segment sculptured much as in the soldier.

Hairs less coarse than in the soldier, present also on the thorax; hairs on the legs and antennæ longer and more abundant, on the scapes abundant and oblique.

Color very much like that of the soldier.

Described from four soldiers and twenty-one workers from Akenge (Lang and Chapin), all taken from the stomachs of toads (*Bufo polycercus* and *funereus*) and frogs (*Arthroleptis variabilis*).

This species is certainly distinct from *caffra* in the greater size and different shape of the head of the soldier, the long acute and curved epinotal spines and different shape of the thorax. It is evidently a Rain Forest insect, whereas *caffra* seems to be confined to dry country.

Pheidole aurivillii Mayr variety **attenuata** Santschi

Medje, ♃, ☿; Bafwabaka, ♃, ☿ (Lang and Chapin); Walikale to Lubutu, ♃, ☿, ♀, "taken from a colony under bark of a fallen tree trunk" (J. Bequaert). I refer numerous specimens from these localities to Santschi's variety, because they are of very small size and dark color, the soldiers measuring only 3.5 to 4 mm., the workers 2 to 2.5 mm.

The type of the species is considerably larger (soldier, 4.6 to 5 mm.; worker, 3 mm.). According to Santschi, the species varies much in stature and color. The females from Walikale measure 7 mm. and are dark brown, like the soldiers and workers, with dull yellowish brown wings. If I am correct in my interpretation, *attenuata* would more properly constitute a distinct subspecies.

Pheidole caffra Emery subspecies **bayeri** Forel variety **thysvillensis**, **new variety**

SOLDIER.—Length 4 to 4.5 mm. Smaller than the typical *bayeri*, with the head of the same shape, but subopaque and with only the front and occiput somewhat shining. The occipital depression is less distinct than in the subspecies *abyssinica* Forel, and the rugæ are anteriorly less numerous, coarser, and farther apart, but very fine and distinctly transverse on the occiput. The antennal scapes are shorter than in the typical *bayeri*, reaching only a little beyond the middle of the head. The suberect epinotal spines are not pointed as in *abyssinica* and *bayeri* but somewhat longer, of uniform thickness or even slightly enlarged at the tips, which are blunt. The base of the epinotum is not longer than broad. The postpetiole is somewhat narrower than in *bayeri* and *abyssinica*, with blunter lateral angles. Thorax, petiole, and postpetiole more finely rugulose-punctate than in *abyssinica;* gaster shining, with the base of the first segment subopaque and alutaceous. Color as in *abyssinica*, with the head and thorax ferruginous brown but varying in some specimens to pale ferruginous red, with the gaster black or brown and the base of the first segment and posterior borders of all the segments paler and more reddish or yellowish.

WORKER.—Length 2 mm. Smaller than the worker of *bayeri*. Head elliptical, without posterior corners, longer than broad. Antennal scapes extending two-fifths their length beyond the occipital border, which is rather sharply marginate. Shining; head and thorax finely reticulate; mesonotum, epinotum, petiole, and ventral and lateral portions of the postpetiole opaque and densely punctate. Ferruginous brown; head castaneous; mandibles except their teeth, yellowish.

Described from numerous specimens taken both by Lang and Bequaert at Thysville, apparently from the same colony, "nesting in sandy soil in the savannah."

Pheidole caffra subspecies **senilifrons**, new subspecies

Text Figure 32

SOLDIER.—Length 4 mm. Differing from the typical form and the subspecies *bayeri* in the sculpture of the head, the sharp longitudinal rugæ between the prolonged frontal carinæ being surrounded by the rugæ from the sides of the head, which run up to the posterior corners, then turn at a right angle and run transversely on the occipital lobes to the occipital furrow. These rugæ are quite as strong as those on the front, but denser. The head is a little longer and a little more depressed posteriorly than in the variety *thysvillensis*, the transverse welt of the mesonotum less pronounced; the blunt epinotal spines distinctly shorter. The sculpture of the thorax and pedicel and the color and pilosity are much as in that variety.

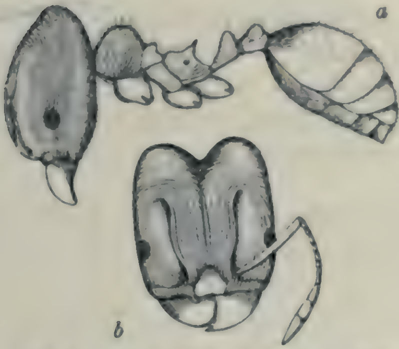


Fig. 32. ***Pheidole caffra*** **subspecies** ***senilifrons*****, new subspecies. Soldier.** ***a*****, body in profile;** ***b*****, head from above.**

Worker.—Length 1.8 mm. Very similar to the worker *thysvillensis* but the pronotum is smooth and shining and the epinotal spines are shorter, less obtuse, and more erect.

Four soldiers and a single worker from Yakuluku, where they were found "nesting in a small mushroom-shaped termitarium" (Lang and Chapin).

Pheidole kohli Mayr

A single soldier from Medje (Lang and Chapin), without further data, agrees very closely with Mayr's description of this species.

Pheidole kohli Mayr, variety

A single imperfect soldier and five females, three of them winged, taken from the stomachs of a toad (*Bufo regularis*) and a frog (*Rana ornatissima*) from Garamba (Lang and Chapin), appear to represent an undescribed variety or subspecies of *kohli*, the soldier being darker and having a distinctly narrower head. The pedicel, gaster and funiculi are, however, lacking in the single specimen of the soldier. It seems to be undesirable to base a new name on such defective material.

Pheidole megacephala (Fabricius)

Niangara, ☿; Akenge, ♀; Stanleyville, ♀; Banana, ♃, ☿ (Lang and Chapin); Zambi, ♃, ☿, ♀ (Bequaert and Lang); Matadi, ♃, ☿; Thysville, ☿; Boma, ♃, ☿, ♀; Malela, ♃, ☿, ♀ (J. Bequaert). All these specimens belong to the typical form of this well-known tropicopolitan pest. I have been unable to recognize among it Forel's subspecies *nkomoana*, originally described from the vicinity of Stanleyville. In the colony taken at Zambi by Lang and Bequaert there are several specimens of an interesting *Microdon* larva, which is figured and described in Part VI. The female specimens from Akenge and Stanleyville, five in number, were taken from the stomach of a toad (*Bufo polycercus*) and a frog (*Rana mascareniensis*).

Pheidole megacephala subspecies **ilgi** (Forel)

A soldier and several workers taken by Dr. Bequaert at Lesse from a colony nesting at the base of a papaya. It was on the head of one of the soldiers in this colony that he found a singular phorid fly, *Plastophora aculeipes* (Collin), subsequently referred to by H. Schmitz.[1]

Pheidole megacephala subspecies **melancholica** (Santschi)

Six soldiers, five workers, and seven females, mostly winged, taken at Garamba (Lang and Chapin) from the stomachs of a toad (*Bufo regularis*) and two frogs (*Rana ornatissima* and *Kassina senegalensis*). The female is a little larger than the female of the typical *megacephala*, with the head and thorax more sharply sculptured and the color of the body, including the clypeus and mandibles, darker, almost black; the legs more yellowish, as in the worker.

This is the host of the singular workerless parasitic ant, *Anergatides kohli*, recently described and figured by Wasmann from the vicinity of Stanleyville.[2]

Pheidole megacephala subspecies **punctulata** (Mayr)

Boma, ♃, ☿, ♀; Ngayu, ♃, ☿; Avakubi, ♃, ☿; Stanleyville, ♃, ☿, ♀, ♂; Bolobo, ♃, ☿; Faradje, ♃, ☿; Zambi, ♃, ☿, ♀; Niapu, ♃, ☿; Garamba, ♃, ☿; Banana ♃, ☿ (Lang and Chapin).

A well-known and widely distributed Ethiopian form, apparently more abundant in the Belgian Congo than the typical *P. megacephala*. The specimens from various colonies show considerable variation in color, some being dark brown, others pale and more yellowish or reddish, especially those from Stanleyville and Banana. Mr. Lang gives the native name of the species as "tuegeke" and his notes give the nesting sites as "under heaps of decomposed, moist grass," "in fallen stems of *Hyphæne*," "in mushroom-shaped termitaria in swamps," and "in the tops of termite mounds."

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[1] 1916, Zoolog. Meded. Mus. Leiden, II, p. 28.

[2] 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 281.

Pheidole minima Mayr subspecies **malelana,** new subspecies

SOLDIER.—

Length 2.3 mm.

Head shaped much as in *P. megacephala*, without the mandibles a little longer than broad, distinctly but not broadly depressed in the occipital region. Eyes small, flat, at the anterior third of the head. Clypeus flat, ecarinate. Frontal area small, impressed; frontal carinæ diverging, reaching to the posterior third of the head, bounding distinct scrobes for the antennal scapes, which are half as long as the head. Funicular joints 2 to 8 distinctly broader than long, club longer than the remainder of the funiculus. Mandibles large and convex, coarsely bidentate at the tip. Thorax robust, pronotum very convex, with small but distinct humeral tubercles. Mesonotum falling almost vertically to the pronounced mesoëpinotal constriction, with a slight transverse convexity in the middle. Epinotum broader than long, concave and sloping in the middle, its spines rather erect, shorter than the interval between their bases, with pointed tips. Petiole with rather high, anteroposteriorly compressed, distinctly emarginate node. Postpetiole only one and one-half times as broad as the petiole, broader than long, with the sides angularly produced. Gaster much smaller than the head, elliptical, convex, with subtruncate anterior border. Legs stout, femora thickened in the middle.

Shining; mandibles sparsely punctate; clypeus rather smooth in the middle, indistinctly rugulose on the sides; anterior two-thirds of head with sharp, but not coarse, longitudinal rugæ; occipital lobes with small, sparse, piligerous punctures. Pronotum and gaster very smooth and shining; pedicel smooth but less polished; meso- and epinotum opaque, densely punctate.

Hairs yellow, sparse, suberect on the body, short and appressed on the legs and antennal scapes.

Castaneous; pronotum, first gastric segment, borders of clypeus, and mandibles blackish; remainder of mandibles and clypeus, cheeks and anterior portion of front, petiole and postpetiole yellowish red; legs brownish yellow; terminal gastric segments pale brown; posterior borders of all the gastric segments broadly yellowish.

WORKER.—

Length 1.5 mm.

Head subrectangular, as broad as long and as broad in front as behind, with very feebly convex sides and nearly straight posterior border. Eyes just in front of the middle. Mandibles with the entire apical border finely denticulate. Clypeus convex, with rounded, entire anterior border. Antennal scapes reaching beyond the posterior corners of the head to a distance equal to twice their diameter. Thorax shaped much as in the soldier, but the pronotum narrower and longer. Epinotal spines reduced to minute slender teeth scarcely longer than broad at their bases. Superior border of petiolar node straight and entire; postpetiole small, a little broader than the petiole, subglobular.

Pilosity, sculpture, and color as in the soldier, but the head smooth and shining, with only the cheeks delicately longitudinally rugulose.

Described from a single soldier and three workers taken by Lang from a colony nesting in a stem of *Hyphæne* at Malela.

This form agrees with the typical *minima* in size and in most of its characters but the color is very different, the postpetiole is much narrower in proportion to the petiole in both soldier and worker, and the antennal scapes of the latter are decidedly longer. Santschi has described a variety, *catella*, from Nigeria and the Gold Coast, which is evidently colored like *malelana* but his description is too brief to enable me to judge of its other characters. He has also described a subspecies, *corticicola*, from the French Congo. The soldier of this form measures 3 mm., the worker 2.3 mm. Both are red or yellow and in the soldier the frontal carinæ extend to the posterior quarter of the head.

Pheidole mylognatha, new species

Text Figure 33

SOLDIER.—

Length 6 mm.

Head large, subrectangular, 2 mm. broad and 2.3 mm. long, as broad in front as behind, with straight, parallel sides, deeply and angularly excised posterior border, with depressed occipital surface and faint depressions on the sides of the front for the antennal scapes. Occipital and frontal groove deep. Eyes small, flat, at the anterior third of the head. Mandibles very convex, probably bluntly bidentate at apex but the apical borders are worn away in the specimen. Clypeus very short, concave and indistinctly carinate in the middle, swollen and convex on the sides; the anterior border rather deeply emarginate in the middle and sinuate on each side. Frontal carinæ short, diverging; frontal area indistinct. Antennæ small and slender; scapes when bent outward not reaching to the eyes, terete and slightly curved at the base; joints 2 to 8 only slightly longer than broad; club distinctly shorter than the remainder of the funiculus. Thorax small, much shorter than the head and less than half as wide through the pronotum, which is bluntly tuberculate on the sides both above and below. Mesonotum short, rapidly sloping to the pronounced mesoëpinotal constriction, anteriorly with a feeble transverse impression and a small, sharp transverse ridge behind it. Epinotum distinctly broader than long, broadly concave and sloping in the middle, the base shorter than the declivity, marginate on the sides, the marginations continued into the spines which are short, acute, and erect, a little longer than broad at their bases, less than half as long as their interval. Petiole small and short, less than twice as long as broad, broader behind than in front, the node blunt, transverse, and emarginate in the middle. Postpetiole broader than long, its sides produced as short, acute, backwardly directed spines, the distance between the tips of which is about three times the width of the petiole. Gaster smaller than the head, elliptical, flattened dorsoventrally. Femora only moderately thickened in the middle.

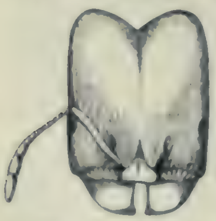


Fig. 33. *Pheidole mylognatha*, new species. Soldier, head from above.

Shining; mandibles sparsely punctate in the middle, coarsely striated at the base and along the apical margins. Clypeus rugulose, irregularly in the middle, longitudinally on the sides. Anterior half of head longitudinally rugose, with punctate interrugal spaces, the punctures becoming more numerous on the very feeble scrobe-like depressions; posterior half of head very smooth and shining, with a few sparse, piligerous punctures. Thorax loosely rugose and somewhat reticulate-punctate on the sides, concavity of epinotum finely transversely striated. Petiole and postpetiole indistinctly punctate-rugulose, the latter smoother and shining above. Gaster and legs smooth and shining, with sparse, piligerous punctures.

Hairs whitish, delicate, sparse, erect or suberect on the body, shorter, more abundant and appressed on the legs; almost absent on the scapes.

Rich castaneous brown; gaster, except the base of the first segment, darker, almost black; legs and funiculi a little more reddish, the femora infuscated in the middle.

WORKER.—

Length 2 mm.

Head a little longer than broad, as broad in front as behind, with feebly convex sides and feebly concave posterior border. Eyes rather convex, just in front of the middle of the sides. Mandibles with the whole apical border very finely denticulate. Clypeus convex, its anterior border entire, broadly rounded. Antennal scapes extending fully one-fourth their length beyond the posterior border of the head. Thorax and petiole very similar to those of the soldier but the mesonotum more sloping and with much feebler transverse convexity. Postpetiole only one and one-half times as broad as the petiole, its sides produced as short angles or conules.

Shining; mandibles finely and indistinctly striate; clypeus and cheeks longitudinally rugulose; area between the frontal carinæ and the eyes reticulate, remainder of head very smooth and shining. Pronotum smooth and shining above, reticulate on the sides; meso- and epinotum subopaque, densely punctate; petiole and postpetiole more finely punctate, the nodes above smooth and shining like the gaster and legs.

Pilosity and color much as in the soldier, but the fine appressed hairs on the scapes as abundant as on the legs.

Described from a single soldier and two workers taken at Banana by Lang and Chapin.

This species is related to *P. schultzei* Forel from the Kalahari Desert, as I find by comparison with cotypes received from Prof. Forel. The head of the *schultzei* soldier, however, has more convex sides, more rounded posterior corners, a less deeply excised posterior margin, less deeply impressed occipital groove, longer antennæ, and a very different color, being yellowish red, with the legs and base of gaster yellow. The worker *schultzei* departs further from that of *mylognatha* in being more slender, with decidedly longer legs and antennæ, in lacking spines on the epinotum and in having a longer postpetiole, which is scarcely angular on the sides. It is sordid or brownish yellow, with the head darker behind and on the sides.

Pheidole niapuana, new species

Text Figure 34

SOLDIER.—

Length 5 to 5.5 mm.

Head, excluding the mandibles, as broad as long (2.3 mm.), cordate, considerably broader behind than in front, and with the occipital border very deeply and arcuately excised. Behind the eyes the sides are convex but in front feebly concave. Eyes small, moderately convex, situated just in front of the anterior third of the head. In profile the head is most convex in the middle both above and below, but depressed in the occipital region. Frontal and occipital groove distinct but rather shallow anteriorly. Mandibles large and convex, with two blunt teeth at the apex. Clypeus flat, carinate, its anterior border emarginate in the middle, bluntly bidentate, sinuate on the sides. Frontal area large, subtriangular, without a median carinula; frontal carinæ short, diverging, continued back as delicate rugæ bordering an indistinct scrobe-like depression for the antennal scapes. Antennæ slender; scapes terete, curved at the base, reaching to the middle of the sides of the head; all the funicular joints longer than broad, club somewhat shorter than the remainder of the funiculus. Gula with a pair of very large, blunt teeth at the anterior margin. Thorax short and robust, shorter than the head without the mandibles. Pronotum with very distinct and moderately acute humeral tubercles, mesonotum sloping to a deep mesoëpinotal constriction, with a sharp transverse welt or ridge; epinotum broader than long, concave and sloping in the middle; spines acute, somewhat shorter than the base, a little longer than their interval, directed upward and slightly outward and backward, with their tips distinctly curved backward. Petiole very small, narrow, fully twice as long as broad, with subparallel sides, the node short, with acute transverse superior border, distinctly notched in the middle. Postpetiole three times as broad as the petiole, subtriangular, broader than long and broader behind than in front, with prominent, bluntly angular sides, its ventral surface with a distinct tooth, its dorsal surface convex and rounded. Gaster broadly elliptical, smaller than the head. Legs rather slender, femora only moderately thickened in the middle.

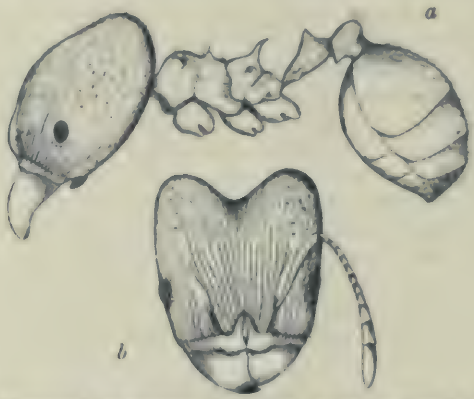


Fig. 34. *Pheidole niapuana*, new species. Soldier. *a*, body in profile. *b*, head from above.

Shining; mandibles sparsely punctate, striated at their bases. Head longitudinally rugose, the rugæ sharp, widely separated and not very strong, the interrugal spaces with dense shallow punctures, most distinct on the space between two rugæ representing a very feeble scrobe-like area. The rugæ on the front diverge, passing to the summits of the occipital lobes. Sides of head with finer, denser rugæ. Occipital lobes with large, scattered foveolæ. Thorax, petiole and postpetiole covered with fine shallow punctures, more pronounced on the mesopleuræ and extremely fine and dense on the petiole and postpetiole which are opaque. Pronotum transversely rugulose. Basal half of first gastric segment finely reticulate-punctate and less shining than the remainder of the gaster.

Hairs reddish yellow, glistening, coarse, uneven, erect, and rather sparse on the body; short, sparse, and appressed on the scapes and legs.

Rich ferruginous red; clypeus and borders of mandibles black; legs and antennæ paler and more yellowish red; gaster infuscated on the sides and behind the first segment.

WORKER.—

Length 3 to 3.5 mm.

Head nearly circular, scarcely longer than broad, without posterior corners, occipital border strongly marginate. Mandibles large, their apical borders long and finely denticulate, with two larger terminal teeth. Clypeus convex, with rounded, entire anterior border. Eyes just in front of the middle of the head, moderately large and convex. Antennæ slender, scapes extending about two-fifths their length beyond the occipital border. Thorax slender, the pronotum rather depressed above, bluntly tuberculate on the sides near the middle. Mesonotum long and sloping, with a broad transverse impression in front and a transverse swelling behind it. Mesoëpinotal constriction deep and broad. Epinotum as broad as long, with subequal base and declivity, not concave in the middle as in the soldier. Spines longer, as long as the base and more strongly curved backward. Petiole similar to that of the soldier, but with a lower, blunter node. Postpetiole scarcely twice as broad as the petiole, longer than broad, rounded above and on the sides. Gaster distinctly smaller than the head. Legs slender.

Shining; finely reticulate; mandibles finely and densely striate, lustrous; gaster more shining than the head and thorax; meso- and epinotum and ventral and lateral portions of the petiole and postpetiole subopaque, densely punctate.

Pilosity much like that of the soldier, sparser on the body but more abundant on the legs. Color much paler, of a more yellowish red, or reddish yellow, with paler legs and brown gaster, the latter in most specimens yellowish at the base.

Described from numerous specimens of both phases taken by Lang and Chapin at Niapu "from nests in the rotten wood of fallen trees or in old roots."

This species is evidently related to *P. areniphila* Forel of the Kalahari Desert but is certainly distinct, being larger and differing in many details of structure and sculpture.

Pheidole saxicola, new species

Plate VII; Text Figure 35

SOLDIER.—

Length 5.5 to 6 mm.

Head subrectangular, nearly 3 mm. long and very nearly as broad, scarcely broader behind than in front, with straight subparallel sides, rectangular anterior corners, deeply and angularly excised posterior border, and deep occipital and frontal groove. In profile the occipital region is very feebly depressed and the eyes are small, feebly convex, and at the anterior third of the sides. Gula anteriorly with prominent, blunt teeth. Mandibles convex, with two large apical and two basal teeth and a few denticles along the intermediate border. Clypeus convex and carinate in the middle, its anterior border broadly and feebly excised in the middle and sinuate on each side. Frontal carinæ very short, diverging; frontal area distinct, with a median carinula. Antennæ slender, scapes reaching the middle of the head; funicular joints all longer than broad; club shorter than the remainder of the funiculus. Thorax shorter than the head, robust, through the pronotum nearly half as broad as the head, with very blunt humeri, convex and rounded in profile. Mesonotum sloping to the deep meso-ëpinotal constriction with merely a trace of a transverse convexity in the middle. Epinotum broader than long, concave and sloping in the middle, in profile with the base distinctly shorter than the declivity; spines short, suberect, acute, less than half as long as the base and about half as long as their interval. Petiole about one and one-half times as long as broad, broader behind than in front, with concave sides; node transverse, its superior border sharp, feebly excised in the middle. Postpetiole broader than long, about two and one-half times as broad as the petiole, its sides produced as short, acute, slightly backwardly directed spines, its ventral surface with a small, acute tooth. Gaster smaller than the head, subcircular or very broadly elliptical, somewhat flattened above. Legs with moderately thickened femora.

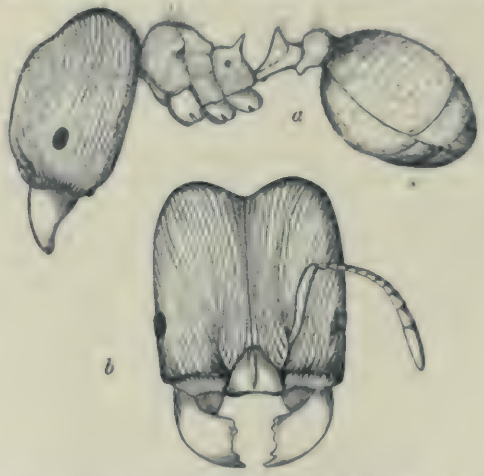


Fig. 35. *Pheidole saxicola*, new species. Soldier. *a*, body in profile; *b*, head from above.

Shining throughout; mandibles coarsely striate, smooth and coarsely punctate in the middle. Clypeus longitudinally rugulose, less distinctly in the middle than on the sides. Head rather finely and sharply longitudinally rugose, the rugæ diverging on the front and continued to the posterior corners, where they meet the also slightly divergent rugæ between the frontal carinæ and the eyes. The interrugal spaces are loosely reticulate. There are no transverse rugæ on the occiput but only a finer continuation of the more anterior sculpture. Thorax, petiole, and postpetiole indistinctly and loosely punctate rugulose, the prothorax transversely; epinotum with fine, dense but shallow punctures, so that the surface is more opaque. Gaster with fine, sparse, piligerous punctures.

Hairs yellowish, partly coarse, sparse, uneven and suberect and partly short, much more abundant, softer and appressed or subappressed like long, coarse pubescence. Legs with numerous short, oblique hairs; scapes with a few longer scattered and coarser hairs.

Dark ferruginous red; mandibles, sides and border of clypeus, and frontal carinæ, blackish; petiole, postpetiole, and gaster, except more or less of the base of the first segment, dark brown or blackish. Legs a little paler than the thorax.

WORKER.—

Length 2.7 to 3 mm.

Head subrectangular, as broad in front as behind, with straight, subparallel sides, rounded posterior corners and nearly straight posterior border. Eyes convex, at the middle of the sides. Mandibles rather large, deflected at the tip, with denticulate apical borders and two larger terminal teeth. Clypeus distinctly carinate, with the anterior border very feebly sinuate in the middle. Antennal scapes extending one-third their length beyond the posterior corners of the head. Thorax similar to that of the soldier, but more slender, especially through the pronotum. Base of epinotum a little longer than the declivity; spines slender, acute, erect, about half as long as their interval. Petiole slender, twice as long as broad, scarcely broader behind than in front, with the sides only very faintly concave; node transverse, its border distinctly notched in the middle. Postpetiole twice as broad as the petiole, as long as broad, subglobose, not toothed on the ventral side. Gaster about as large as the head.

Shining; mandibles subopaque, finely striatopunctate. Sides of head delicately longitudinally rugulose and reticulate. Thorax, petiole, and postpetiole finely and densely punctate, opaque; upper surface of pronotum and postpetiole smooth and shining. Gaster and legs shining, sparsely punctate.

Pilosity like that of the soldier but less abundant. Antennal scapes, like the legs, with numerous oblique hairs.

Brown; head darker above and behind; gaster, except the edges of the segments, middle portions of legs, fore coxæ, and usually also the pronotum and upper surfaces of the petiolar nodes, darker than the posterior portion of the thorax.

Described from numerous specimens taken by Lang, Chapin, and Bequaert at Zambi (type locality) and by the latter at Boma.

This ant is certainly very closely related to *P. sculpturata* Mayr and might be regarded as a subspecies, but it will fit neither Mayr's description of the typical form from South Africa nor Santschi's and Forel's descriptions of the various subspecies from East and West Africa. Mr. Lang's note shows that it is a harvester. "The nests were found on a dry hill at the Post of Zambi in rocky soil. One of the entrances, the largest of three, can be distinctly seen in the photograph (Plate VII). The ants excavate their nests in the small amount of soil between the rocks and all or nearly all of them remain under ground during the day. They work during the night up to about 8 A.M. Then the workers may be seen moving along in files, accompanied by the soldiers, and the latter carry seeds for a distance of some fifteen yards. They come and go in different directions indicated by runways left between the accumulated masses of débris and distinctly visible in the photograph. The débris, consisting of seeds and chaff, lies about the nest to a depth of four centimeters and over an area of some sixty centimeters. It is very difficult to obtain a view of the interior of the nest on account of the rocky soil. Some of the kitchen-middens about the nest entrances contained the dried remains of various ants and Coleoptera. In another locality the same species of ant was seen to have collected seeds of entirely different plants but of about the same size."

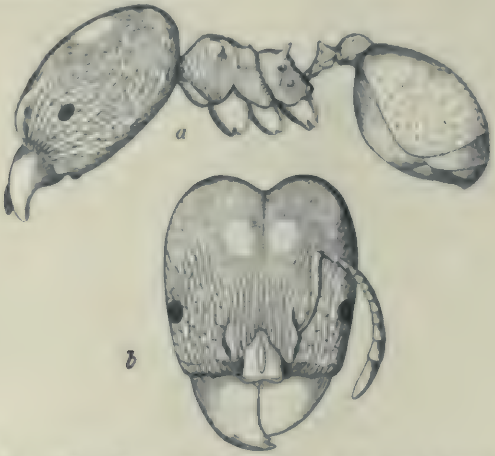


Fig. 36. *Pheidole speculifera* Emery. Soldier. *a*, body in profile; *b*, head from above.

Pheidole speculifera Emery

Four soldiers from Faradje, without further data, and five workers from the stomach of a frog (*Rana ornatissima*) from Garamba agree very closely with Emery's description of the types from Abyssinia, but the workers are darker. Forel has described a variety, *cubangensis*, from Mossamedes and records it also from the Belgian Congo, but this form seems to be very close to the type. My specimens are not as large, since none of the soldiers measures more than 6 mm., whereas Forel gives the length of *cubangensis* as 7 mm. He describes the whole head as opaque, whereas my specimens have a pair of elliptical, very smooth, and shining areas on the vertex in the midst of the opaque and finely punctate sculpture (Fig. 36a and *b*).

MYRMICARIA W. Saunders

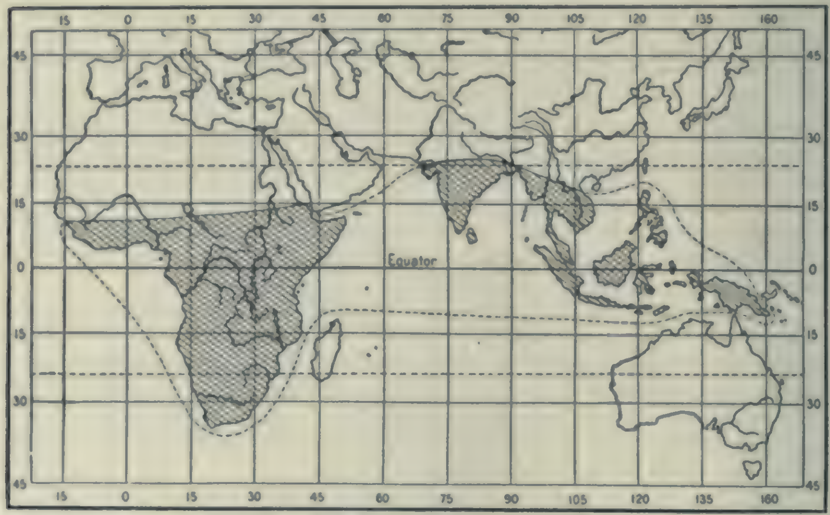
Small or medium-sized, coarsely hairy, brown or black ants, with monomorphic WORKERS, which have 7-jointed antennæ, the funiculus enlarged toward the tip but not clavate and all the joints, except the first, considerably longer than wide. Mandibles moderately large, subtriangular, with coarsely dentate apical border. Clypeus broad and convex. Frontal area indistinct behind. Frontal carinæ short, rather far apart, not strongly diverging posteriorly. Eyes not very large, convex, behind the middle of the head; ocelli absent. Thorax with indistinct or obsolete promesonotal suture; mesoëpinotal suture deep, the mesoëpinotal constriction pronounced; the sides of the mesonotum raised and subauriculate behind. Epinotum armed with a pair of long, acute spines, which are often lobate or expanded at the base; inferior corners of pronotum dentate or spined. Petiole with a long peduncle sharply marked off from the abrupt node, which is high and rounded, subconical, sometimes laterally compressed. Postpetiole shaped like the node of the petiole, strongly contracted posteriorly. Gaster subglobose, its basal segment somewhat truncate in front. Legs long; median and hind tibiæ with simple spurs; tarsal claws simple.

FEMALE considerably larger than the worker. Head and antennæ of very similar structure, the latter being 7-jointed. Thorax robust; mesonotum and scutellum very convex, the pronotum vertical in front though well developed, the epinotum with stouter and broader spines than in the worker. Pedicel as in the worker. Gaster much more voluminous, longer than wide, convex above; the basal segment truncate anteriorly. Wings long, with strongly marked veins, the anterior pair with an open radial cell, a single cubital and a discoidal cell.

MALE nearly as large as the female but more slender. Antennæ 13-jointed, filiform, the scape short, about as long as the second funicular joint, the first joint very short, not swollen, the remaining joints all much longer than broad. Eyes large but not very convex; ocelli rather small. Mandibles small and vestigial, sublinear, with rounded edentate tips, which do not meet. Frontal carinæ short. Mesonotum with Mayrian furrows; epinotum without spines. Petiole very long, its node low; that of the postpetiole of a similar shape, decidedly longer than broad. Gaster cordate, scarcely longer than broad, convex above, concave below. External genital appendages long and narrow, blade-like. Cerci present, but minute. Legs slender. Wings rather short, venation as in the female.

This extraordinary genus may be recognized at once by the 7-jointed antennæ of the worker and female and the unique structure of the abdomen in the male. The species are distributed over the Ethiopian, Indomalayan, and Papuan Regions but do not enter Australia (Map 21). The majority of the species and the largest are Ethiopian. The large species form crater nests in the soil; some of the smaller, both in Africa and in the Orient, make small carton nests on the under sides of leaves.

One of Mr. Lang's photographs (Pl. VIII, fig. 1) of crater nests of *M. eumenoides* is very suggestive in connection with some observations of Petch[1] on the Indian and Ceylonese *M. brunnea* Saunders. This ant, he says, "brings up from its nest underground grains of sand and particles of earth through a small hole about a centimeter in diameter; it is generally observed on footpaths. These particles are at first arranged on one side of the hole in a crescentic mound about 3 centimeters high which curves round and slopes away to nothing on either side of the hole, the distance between the vanishing horns on the crescent being about 12 centimeters. The ants run up the slope from the hole with their burden and drop it over the ridge down the steeper outer side. The most striking feature of this is that when the hole is situated in the middle of a path, away from any bank, the ridge is always on the windward side of the hole. A smaller ridge of the same shape and in the same position is constructed by *Pheidole* (? *nietneri* Emery). If undisturbed *Myrmicaria* eventually constructs a complete funnel around the hole." It would seem that the craters of *M. eumenoides* photographed by Mr. Lang were constructed in a spot protected from the wind or during a calm since they show no definite orientation of their steeper slopes.



Map 21. Distribution of the genus *Myrmicaria*.

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[1] 1906, Ann. Roy. Botan. Gard. Peradenyia, III, p. 196.

Myrmicaria eumenoides (Gerstæcker) subspecies **opaciventris** (Emery)

Plate VIII, Figures 1 and 2

Malela, ☿; Thysville, ☿; Stanleyville, ♀, ♂; Avakubi, ☿, ♀; Medje, ☿, ♀, ♂; Akenge, ☿; Bafwabaka, ☿; Ngayu, ☿; Faradje, ☿, ♀ (Lang and Chapin); Walikale to Lubutu, ☿, ♀ (J. Bequaert); Yakuluku, ♀ (J. Rodhain). Seventy-five workers and one female from Bafwabaka, Ngayu, Medje, Akenge, and Stanleyville were taken from the stomachs of toads (*Bufo regularis*, *B. funereus*, and *B. superciliaris*); a single worker from Faradje was taken from the stomach of a frog (*Rana occipitalis*).

Neither Forel nor Santschi seems to me to have recognized this form very explicitly. Several years ago I received from the former six workers labelled "Benguela (Buchner)" and, as Emery's ergatotypes bore the same label and were also received from Forel and as my specimens agree perfectly with Emery's description, I feel confident that they are cotypes. Later I received a worker and three deälated females from Gaboon (Staudinger) and, as Emery mentions specimens from the same locality, I believe that I have before me also the female of the true *opaciventris*. The workers measure about 5 to 6 mm. and are pale ferruginous brown, with the antennæ, legs, and gaster more fuscous. The mandibles have oblique 5-toothed blades; the clypeus is carinate. The epinotal spines are rather slender and very slightly bent downward, the base of the epinotum is less concave than in the typical *eumenoides*, the peduncle of the petiole is distinctly shorter and not longer than the node. The petiolar and postpetiolar nodes are laterally compressed and of the same height, the ventral surface of the postpetiole, unlike that of *eumenoides*, is swollen, and projecting and angular in front. The surface of the head and thorax is somewhat less shining than in *eumenoides*, the rugæ on the front, pleuræ, pro-, meso- and base of epinotum more sharply and regularly longitudinal and not reticulate. The gaster has the basal half or, in some specimens, the whole surface opaque and densely punctate, whereas it is smooth and shining in typical *eumenoides*. The nodes of the petiole and postpetiole have shining summits and in some specimens the sides of the petiole are also smooth and shining, in others like those of the postpetiole, finely punctate and even feebly longitudinally rugulose. In the female, which measures 13 mm., the petiole and postpetiole are sharply longitudinally rugose, the summit of the former concentrically rugose, the scutellum vermiculately rugose. Emery's description of the male, which I have not seen, includes no mention of characters that would distinguish it from the male of the typical *eumenoides*.

Numerous specimens from the various Congo localities cited above seem to me to be referable to Emery's subspecies, though they differ more or less in the sculpture of the petiole, postpetiole, and gaster and in being mostly of a darker color. They average larger than the specimens of variety *congolensis* and variety *crucheti*, the workers being 5 to 6.5 mm. The petiole and postpetiole, especially the latter, are nearly always more or less longitudinally rugulose on the sides, though sometimes merely punctate, as Emery remarks in the original description. The specimens from Walikale have the entire gaster opaque and punctate, whereas in others it is punctate usually only on the anterior half of the first segment. This character, however, varies in individuals from the same colony. Santschi says that the gaster of the worker is "entièrement sculpté, mat, brun clair," but Emery describes the gaster as fuscescent, with the anterior half of the first segment opaque.

Trägårdh[1] and Arnold[2] have described the nests of the typical *eumenoides* of East and South Africa. The latter's account runs as follows.

> The colonies of this species are usually very large, often comprising 1000 or more workers. The latter bite and sting fiercely, but the sting is rather blunt, and does not easily pierce the human skin. Although their gait is slow, they are nevertheless active insects, travelling over large areas in search of food, which seems to consist chiefly of other insects. They do not appear to be aphidicolous, nor to attend membracid or lepidopterous larvæ for their secretions, yet they are known to harbour in their nests many myrmecophilous insects. A nest examined by me contained the following species of beetles: *Allodinarda myrmicariæ* Brauns; *Ogmocerus raffrayanus* Brauns and *Batrisus myrmecariophilus* Brauns. The Botanical Gardens in Durban are infested with this species, but the examination of a large number of nests revealed only one species of myrmecophile, *Allodinarda kohli* Wasm.; which, however, was plentiful, as many as three dozen being taken in one nest. The nest has numerous entrances, and is surrounded by large heaps of excavated material, often covering an area of several square feet.

Arnold[3] has also described and figured the puparium of a fly (possibly a form allied to *Microdon?*), with a peculiar tray covered with trichomes at the posterior end of the body, as occurring in the nest of *M. eumenoides* with the myrmecophilous beetles cited in the foregoing quotation. The following is his account of the migration of the colony and its guests to a new nest.

> I left this nest without filling up the hole, so that in about a week's time it was filled with rain after a heavy shower. The water must have filtered through the soil and almost saturated the nest, for it took nearly half an hour for all the water to dis-

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[1] 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 45.
[2] 1916, Ann. South African Mus., XIV, p. 266.
[3] 1914, Proc. Rhodesia Sc. Assoc., XIII, p. 25.

appear from the hole. This state of affairs had evidently made the nest so uncomfortable that the ants decided to move to new quarters about 9 feet away. They began to do this about seven o'clock that evening, or perhaps a little earlier, for the migration was in full swing when I came on the scene again at that hour. Remembering the reputation which this ant has for harboring guests, and also the observations made by various entomologists on some European ants which, when moving to a new nest, are in the habit of carrying their guests with them, I decided to watch this migration carefully. At first I could see no guests at all; the workers were carrying in their mandibles only their own larvæ, pupæ or males. In fact I was looking at the workers so attentively that I failed to notice their smaller companions on the road, to which my attention was directed by suddenly catching sight of a Lepismid running by. Going back then to the old nest, I saw at intervals various myrmecophiles crawling out of the pit made by my former excavation, and following the tracks of their hosts, to which they were guided, of course, by the sense of smell. These parasites included three different species of beetles, viz. a staphylinid, and two species of pselaphids, together with the common lepismid found in the nests of nearly all our ants. No time was wasted by any of these insects, for once over the brow of the pit, they continued straight along the narrow path leading to the new quarters. While on th march they were utterly ignored by their hosts, but on arriving at the entrance of the new nest, it was noticed that some of the pselaphids were seized by the ants dawdling around, and taken down into the nest. This change of dwelling took some hours to complete, for at midnight it was still in progress.

Mr. Lang contributes the following note on the habits of the subspecies *opaciventris* at Avakubi: "These ants, called 'dufluguntu' by the natives, are very common and noticeable because they tend to congregate in great numbers about any piece of meat or a dead insect. On one occasion I saw them tear up and carry off a butterfly two inches in diameter in exactly two minutes and a half. They are harmless and therefore not feared by the natives. A young *Manis*, which I kept in captivity, enjoyed making a meal of them. The nests, as a rule built at the bases of trees or bushes, can be easily recognized by the mound of loose earth thrown up while the chambers are being excavated. The walls of the chambers are not hardened or smoothed as in the nests of some other ants. One nest which I examined extended seventeen inches below the surface. It had many ramifications, though most of the brood was found around the roots of the tree. The whole nest, when exposed, covered an area less than two feet in diameter. These ants build long tunnels open above or with small openings (one-eighth inch), surrounded by a heap of loose particles. One of these, more than an inch wide, crossed a certain road in several places. I have seen a number of these tunnels superimposed one above another so that I could drop a stick down thirteen inches. In these tunnels the ants travel back and forth in great numbers."

Myrmicaria eumenoides subspecies **opaciventris** variety **congolensis** (Forel)

This form is not represented among the material collected by Lang, Chapin, and Bequaert. Santschi regards it as an independent subspecies, but it seems to me to be merely a variety of *opaciventris*. Three cotypes of *congolensis* were given me by Forel. Comparison of these specimens, which were taken from the stomach of a scaly ant-eater (*Manis temmincki*) captured by Solon in the Lower Congo, with *opaciventris* show relatively slight differences. They are somewhat smaller, of a more sordid yellowish brown color (possibly due to the action of the gastric juices of the *Manis*), and with much the same sculpture and lower portion of the postpetiole. The epinotal spines, however, are decidedly more slender and more strongly deflected, a character not mentioned in Forel's original description, though noted by Santschi; the head is proportionally smaller and narrower, with straight cheeks, and the gaster is opaque only at the base of the first segment, the remainder being rather shining.

Myrmicaria eumenoides subspecies **opaciventris** variety **crucheti** (Santschi)

Stanleyville, ☿; Leopoldville, ☿; Ngayu, ☿; Avakubi, ☿ (Lang and Chapin). The workers from Avakubi, 22 in number, were taken from the stomachs of toads (*Bufo regularis* and *B. funereus*). I refer numerous specimens from these localities to the variety *crucheti* since they agree with Santschi's very brief description in size (5 to 5.5 mm.) and in having slender but straight epinotal spines. The petiolar node in my specimens is distinctly broader and less compressed laterally than in the typical *eumenoides* and not shorter than the peduncle. The surface of the petiole is not so smooth, though it is not longitudinally rugulose. I have received this same form in all three phases from Rev. Geo. Schwab, who took it at Metit, Cameroon. The female is very similar to that of the typical *eumenoides*, but the head is somewhat smaller, with slightly more prominent posterior corners and the gaster is entirely opaque and punctate, except the bases of the second and following segments. I am unable to detect any differences between the males of the two forms. Arnold describes the wings of the male *eumenoides* as paler than those of the female. This is certainly not the case in *crucheti*.

Myrmicaria salambo, new species

Plate IX, Figures 1 and 2; Text Figure 37

WORKER.—

Length 6 to 7 mm.

Of rather uniform stature and closely resembling *eumenoides* but a little more elongate. Head relatively smaller, as broad as long, excavated behind, convex above, flattened below. Mandibles 5-toothed. Clypeus ecarinate, with entire anterior border. Eyes somewhat larger and more convex than in *eumenoides*. Thorax very similar but promesonotal suture very distinct, impressed, the mesonotal lobes less compressed, their posterior outline in profile less abrupt, more sloping so that the mesoëpinotal impression, though deep, is shallower and less acute than in *eumenoides* and appears longer. Epinotal spines longer, slightly sinuous, with very feebly upturned points, directed backward and slightly outward. Base of epinotum longitudinally concave. Peduncle of the petiole longer than the node, which is thick and evenly rounded, not compressed laterally above. The ventral surface of the petiole armed below with two long, delicate hyaline spines, which curve towards each other and enclose an elliptical space. Postpetiolar node of the same size and shape as that of the petiole, its ventral surface straight in profile, not bulging nor angulate in front. Gaster and legs of the usual shape, the former with a straight, anterior border.

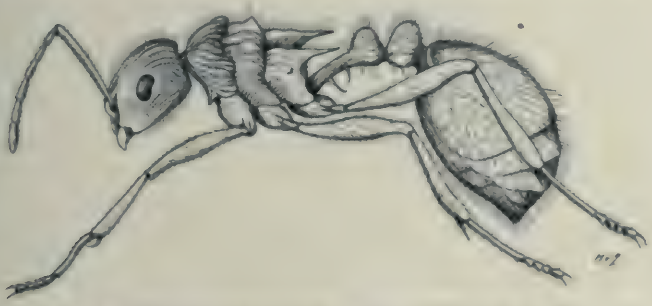


Fig. 37. *Myrmicaria salambo*, new species. Worker in profile.

Shining; mandibles coarsely longitudinally striated; clypeus smooth in the middle, with a few rugules on the sides. Rugosity of head, thorax, and pedicel much as in *eumenoides*, but the rugæ on the dorsal surface of the head and thorax less numerous and less pronounced, without distinct anastomoses; sides of the head with finer and less distinct rugules, so that the surface is more shining. Gaster opaque and very finely punctate only at the extreme base above, otherwise shining. Legs and scapes shining, finely striate.

Hairs dark brown, in length and arrangement much like those of *eumenoides*.

Reddish brown; gaster brownish yellow; legs, including the coxæ and lower pleuræ, darker than the thorax. Mandibular teeth and antennæ blackish.

Described from numerous specimens taken at Garamba (Lang and Chapin) attending scale insects on the buds of a *Protea* which is shown in Plate IX.

This form is so closely related to *eumenoides* that it might, perhaps, be regarded as a subspecies. It is easily recognized by the unique ventral appendages of the petiole. These are so brittle that they are easily broken off, but their basal insertions on the low hyaline lamella in the midventral line of the petiole are usually discernible. Evidently *salambo* is also related to *M. striata* Stitz, specimens of which I have not seen.

Myrmicaria exigua Ern. André subspecies **kisangani,** new subspecies

WORKER.—

Length 3 to 3.5 mm.

Head through the eyes scarcely longer than broad, evenly rounded behind. Mandibles 4-toothed. Clypeus ecarinate, convex, with entire, rounded anterior border. Frontal carinæ subparallel. Eyes convex, just behind the middle of the head. Antennal scapes extending about two-fifths their length beyond the posterior border of the head; apical funicular joint fusiform, enlarged as in the typical *exigua*. Pronotum more flattened above, though bluntly angular on the sides and without inferior teeth. Promesonotal suture distinct. Mesonotum with a small but distinct tooth on each side in front and the posterior lobes larger, erect, and rather acute. Mesoëpinotal impression very distinct and rather long. Epinotum not longer than broad, scarcely narrowed in front, its base longitudinally grooved in the middle, marginate on each side and not longer than the declivity, which is also marginate laterally; spines not longer than their distance apart at the base, straight, directed backward, upward, and outward, their tips not bent inward as in the typical *exigua*. Petiolar peduncle as long as the node, swollen at the spiracles; node longer than broad, as high as long, laterally compressed, constricted behind. Postpetiole longer than broad, broader and higher behind than in front, its node distinctly lower than that of the petiole. Anterior border of gaster straight or even slightly concave, with prominent anterior corners.

Shining; mandibles subopaque, longitudinally striate. Clypeus smooth in the middle, delicately rugulose on the sides. Head smooth in the middle of the front, delicately and irregularly longitudinally rugulose on the sides, posteriorly reticulate-rugose, but much less sharply than in the typical *exigua*. Pronotum with a few longitudinal rugæ, sometimes absent in the middle line; in some specimens reticulately-rugose over the whole surface, with very large meshes as in *exigua*. Sides of pronotum smooth and shining; meso- and metapleuræ subopaque, longitudinally rugulose. Base of epinotum transversely rugulose, declivity smooth and shining. Pedicel, gaster, and legs smooth and shining, with very sparse and minute, piligerous punctures.

Pilosity like that of the typical *exigua*, gray or whitish.

Piceous, nearly black; tips of mandibles, peduncle of petiole, declivity of epinotum, base of postpetiole and in some specimens the whole gaster or only the base of the first segment brown.

Described from numerous specimens taken at Stanleyville (Lang and Chapin) "crawling about the base of an orange tree."

I have compared this form with two cotypes from Sierra Leone (Mocquerys), received many years ago from André, and a worker from

Gaboon (Staudinger). The new subspecies differs in its much darker color, feebler sculpture, laterally more compressed petiolar node and in the shape of the mesonotum, which in the typical form of the species lacks the anterior tooth on each side and has only feeble indications of the posterior lobes. Forel has described a variety, *rufiventris*, from carton nests 3 to 4 cm. in diameter on leaves at St. Gabriel, Lumaliza, and Batiamponde (Kohl), all localities near Stanleyville. This form is larger (3.8 to 4.6 mm.) and, according to Forel, "differs from the type of André only in its paler, reddish abdomen and in having the head more elongate and narrower behind." What Stitz has described as a distinct species, *gracilis*, is evidently nothing more than a subspecies of *exigua*, as is shown by a comparison of his and Forel's descriptions with the cotypes. André failed to mention the enlarged apical antennal joint, but it is very conspicuous in his specimens. Stitz says of the petiole: "Hinten schnürt sich von seiner Basis ein kleines, sekundäres Knötchen ab." This seems to refer to the swelling of the peduncle at the spiracles, a swelling which is visible, though less accentuated in other species of the genus, when the peduncle is viewed directly from above. Forel, however, interprets Stitz's "secondary node" to mean the constricted portion of the segment behind the node. As neither Stitz nor Forel compared their specimens with André's cotypes, they were led to regard *gracilis* as a species.

Cardiocondyla Emery

Worker minute, smooth, almost hairless. Clypeus projecting over the bases of the mandibles, steep in front, with rounded anterior border. Frontal area strongly impressed. Frontal carinæ short and straight. Eyes well developed; ocelli lacking. Mandibles broad, triangular, dentate. Antennæ 12-jointed, with long first funicular joint and 3-jointed club, the last joint very large. Promesonotal suture indistinct; mesoëpinotal constriction well developed. Epinotum armed with spines or teeth. Petiole with long peduncle and small, rounded node. Postpetiole conspicuously large, cordate or transversely elliptical. Gaster formed in large part by the first segment.

Female winged (except in *C. emeryi* Forel), somewhat larger than the worker; head of the same shape but with ocelli. Pronotum not covered by the mesoscutum in front. Petiole and postpetiole usually broader than in the worker. Wings with reduced venation; pterostigma near the middle of the costal border; one closed cubital cell; distal portions of radius and cubitus obsolete; brachius not developed beyond the nervulus but bending up into the submedius. According to Emery, the female of *C. emeryi* is wingless and has the posterior ocelli vestigial.

Male usually ergatomorphic but winged in *C. emeryi*. In this form the antennæ are 13-jointed but in ergatomorphic males they are 10- to 12-jointed; with long scape and more indistinct club. Petiole and postpetiole resembling the corresponding segments of the female, in the male of *emeryi* much as in the worker.

Cardiocondyla emeryi Forel

A single worker taken at Thysville by Bequaert. This minute ant is very widely distributed through the tropics of both hemispheres. It was originally described from the island of St. Thomas in the West Indies, but was later recorded from Syria, Madeira, Madagascar, and the East Indies. Arnold records it from South Africa and my collection contains specimens from the Bahamas, Cuba, Porto Rico, Jamaica, Bermuda, Tepic in Western Mexico, and Miami, Florida. According to Arnold it "is usually found nesting in grassy soil; the entrance to the nest is a minute hole, not surrounded by earth or other substances."

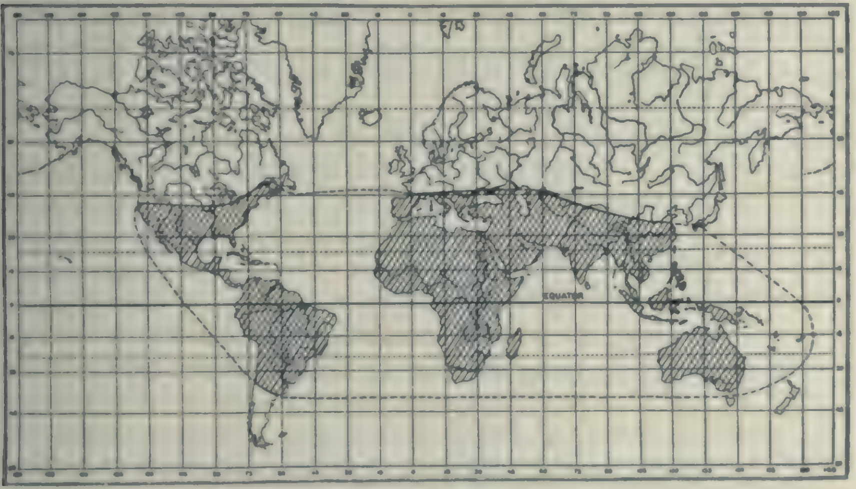
CREMATOGASTER Lund

Crematogaster is one of the largest and most sharply defined genera in the family Formicidæ. The species are all small, with monomorphic worker, decidedly larger female, and the male usually as small as the worker. The worker and female have 10- or 11-jointed antennæ, those of the male are usually 12-jointed. All the phases can be readily recognized by the peculiar structure and articulation of the petiole and postpetiole. The former does not bear a node but is more or less flattened above, the latter is short and articulated to the anterodorsal surface of the gaster, instead of to its anterior end as in other ants. The gaster, moreover, is in the worker and male subtriangular or subcordate, with pointed tip, and its upper surface is concave or more or less flattened, its ventral surface more convex and protuberant. These peculiarities in the structure of the abdomen enable the workers of many species to turn the gaster forward over the thorax and head, so that they are sometimes called "acrobat ants." As a rule, the sting is feebly developed. The anterior wings of the male and female have a discoidal and a single closed cubital cell.

The species of *Crematogaster* all form populous colonies which nest in the ground, under stones, in logs, the cavities of living plants, or in peculiar carton nests attached to the branches or trunks of trees. This habit of making carton nests is best seen in the tropical species, but traces of it survive even in the species inhabiting temperate regions, such as the North American *C. lineolata* (Say). Many of the species have rank and disagreeable odors.

The genus is cosmopolitan (Map 22), though the species scarcely enter the colder portions of the north and south temperate zones. Our common *C. lineolata* (Say) of North America occurs, however, as far north as Nova Scotia. The vast majority of species are confined to the tropics, being particularly numerous in the Neotropical and Ethiopian Regions. The African forms are so numerous and so variable that they constitute a veritable welter of subspecies and varieties. Mayr, Forel, Arnold, and Santschi have all dispaired of reducing this chaos to order. Unfortunately the portion of Arnold's work dealing with the South

African species has been postponed by the war. He has, however, kindly written me concerning certain necessary changes in the synonymy of several of the species and I have adopted his interpretations in the list of Ethiopian species (Part VIII). Dr. Santschi, who has given more attention to the African species of *Crematogaster* than any previous author, has generously examined and identified a series of all the Congo forms collected by Lang, Chapin, and Bequaert and has written the descriptions of several new forms. In the meantime he has published a revision of the subgenera of *Crematogaster*.[1] Forel was the first to begin the splitting of the genus, but Santschi has added several new subgenera. A translation of his table has been included in the key to the genera and subgenera of Myrmicinæ. Santschi has arranged these various subgenera according to their natural affinities in the following sequence:



Map 22. Distribution of the genus *Crematogaster*.

1. *Decacrema*
2. *Orthocrema*
3. *Eucrema*
4. *Neocrema*
5. *Sphærocrema*
6. *Crematogaster, sensu stricto*
7. *Atopogyne*
8. *Paracrema*
9. *Xiphocrema*
10. *Physocrema*
11. *Oxygyne*
12. *Nematocrema*

Of these, at least seven, *Decacrema*, *Orthocrema*, *Sphærocrema*, *Crematogaster*, *Atopogyne*, *Oxygyne*, and *Nematocrema* occur in the Ethiopian Region. In the Congo material before me only *Sphærocrema*, *Crematogaster*, *Atopogyne*, and *Nematocrema* are represented.

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[1] 1918, Bull. Soc. Ent. France, pp. 183–184.

Crematogaster brunneipennis (Ern. André) subspecies **acaciæ** (Forel) variety **victoriosa** (Santschi)

Numerous workers from Zambi (Bequaert), "nesting in a tree trunk." The typical *C. acaciæ* was originally taken by Keller in Somaliland in the swollen spines of acacias. Concerning one of the other varieties (*generosa* Santschi), Santschi writes me as follows: "I received from Mr. G. Arnold of the Rhodesian Museum under the name of *C. brunneipennis* Ern. André variety *omniparens* Forel some workers which differ only in their deeper color from what I have called *acaciæ* variety *generosa*. The female of the latter form is very close to that of *brunneipennis* Ern. André, but the wings are even darker. I believe that *brunneipennis* should be regarded as a subspecies of *C. acaciæ*." That Santschi is correct in regarding both forms as cospecific is proved by a comparison of two cotype workers of *brunneipennis* from Sierra Leone (Mocquerys), sent me by André many years ago, with a cotype of *acaciæ* received from Forel. André's workers are smaller, with longer antennal scapes, smoother and more polished thorax, with somewhat more circular and less cordate petiole, smaller and more slender and more pointed epinotal spines, and darker gaster and head, but the resemblances are so close in other respects that I cannot regard the differences as more than subspecific. As *brunneipennis* has priority of publication, *acaciæ* must be reduced in rank and not *brunneipennis*, as Santschi supposes. Whether *omniparens* is to be retained as a distinct subspecies or is to be attached as a variety to *acaciæ*, I am unable to determine.

Crematogaster castanea F. Smith subspecies **inversa** (Forel) variety **analis** (Santschi)

Bafwasende to Avakubi, ☿ (Lang and Chapin); Thysville, ☿ (J. Bequaert). The specimens from the former locality were collected on the road, without further data; those from Thysville were found "nesting in dry, dead wood, on the soil in the rocky savannah." This and the following are merely color varieties of an extremely variable and widely distributed African and Malagasy species formerly known as *C. tricolor* Gerstæcker.

Crematogaster castanea subspecies **inversa** variety **flaviventris** (Santschi)

Many workers from Garamba (Lang and Chapin), without further data. Both this and the variety *analis* were originally described from the Belgian Congo. The variety *flaviventris* has also been taken in Uganda (C. Alluaud).

Crematogaster excisa (Mayr)

Zambi and Thysville, ☿ (J. Bequaert); near Lie, ☿; Faradje, ☿ (Lang and Chapin). The specimens from Thysville were taken "from a nest in a tree-trunk in the rocky savannah;" those from Faradje "in a hollow tree." The single specimen from near Lie was taken from the stomach of a toad (*Bufo regularis*).

Crematogaster excisa subspecies **andrei** (Forel)

Numerous workers from the Oso River and Sitaweza (between Walikale and Lubutu) (J. Bequaert). Dr. Bequaert took this subspecies at the former locality in the hollow stalks of a myrmecophytic creeper (*Uncaria africana* variety *myrmecophyta*) growing along the shore of the Oso River between Walikale and Lubutu (Part IV), in the latter locality in the hollow stalks of another myrmecophyte (*Cuviera angolensis*) in the Rain Forest (Part IV).

The following new variety of the subspecies *impressa*, though not from the Belgian Congo, was described by Santschi in connection with the forms of *excisa* which I sent him.

Crematogaster excisa subspecies **impressa** (Emery) variety **aglæa** Santschi, new variety

"WORKER.—Black; mandibles, funiculi and tarsi reddish brown. Dorsum of pronotum very densely punctate as in the typical *impressa* (Emery), the longitudinal rugæ being feebly or not at all indicated. Head and thorax narrower. Promesonotal impression feebler as in *euphrosyne*, with a small carina on the front of the mesonotum, which is sharply marginate, less concave than in *andrei* (Forel) and more so than in *impressa* (Emery). Basal surface of the epinotum scarcely broader than the petiole. Spines almost as long as the interval between their bases. Anterior angles of petiole truncated as in *andrei*. Otherwise like *impressa* (Emery).

"Dimbroko, Ivory Coast (Le Moult).

"In *impressa* the funiculi are brownish black and in *andrei* the mesonotal carina is lacking." (Santschi)

Crematogaster excisa subspecies **impressa** variety **euphrosyne** Santschi, new variety

"WORKER.—Length 3.5 mm. More or less pale chestnut brown. Thorax narrow. Pronotum reticulate-punctate in the spaces between the fine longitudinal rugæ. Mesonotum feebly carinate in front. Resembles the variety *brazzai* Santschi,[1] but the latter has a broader thorax, without carina and the sculpture of the thorax is merely reticulate." (Santschi)

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[1] Originally described as a subspecies of *C. impressa* and given in our catalogue (Part VIII) as *C. menileki* subspecies *occidentalis* variety *brazzai*.

Faradje (type locality) and Thysville (Lang and Chapin). The specimens at Faradje were found "nesting in hollow twigs. Snails (*Pachnodus herbigradus* Pilsbry) were found estivating in the same twigs inhabited by the ants and often in such numbers as to clog the passages." *Camponotus foraminosus* was found in similar hollow branches together with the same snails (see p. 248).

Crematogaster excisa subspecies **impressa** variety **sapora** (Forel)

Numerous workers from Yakuluku (Lang and Chapin) "found nesting in the cavities of small mushroom-shaped termitaria."

Crematogaster impressiceps (Mayr)

Panga and Faradje, ☿ (Lang and Chapin). The specimens from Panga were found inhabiting the hollow twigs of *Barteria fistulosa* (see Part IV), those from Faradje were associated with aphids.

Crematogaster impressiceps variety **frontalis** Santschi, new variety

"WORKER.—Length 3 to 3.5 mm. Pale brown; thorax less sculptured than in the typical *impressiceps*. Frontal groove deeply impressed. Stature less variable and smaller than in the typical form of the species and larger than in the variety *longiscapa* Stitz, but the scape also extends beyond the occiput as in that variety." (Santschi)

Numerous specimens from Malela (type locality) and Kunga (Lang, Chapin, and J. Bequaert); those at Kunga found nesting in the hollow internodes of the myrmecophyte *Cuviera* species (Part IV); the specimens from Malela "living in a small carton nest, about 9 cm. long, fixed upon a stalk of *Raphia*."

Crematogaster menilekii (Forel) subspecies **proserpina** Santschi, new subspecies

"WORKER.—Length 3.2 to 4 mm. Pale brownish yellow; head, gaster, and appendages shining; thorax and petiole nearly opaque. Front and sides of head finely striate, the remainder with a few punctures. Anterior border of head and the corners obliquely truncated. Postpetiole narrower than in the typical *menilekii*, completely sulcate in the middle, forming two ovoidal eminences. Gaster broader than the head. Allied to *C. alulai* Emery and *C. menilekii* subspecies *satan* (Forel)." (Santschi)

Numerous workers from Malela (Lang, Chapin, and J. Bequaert), with the following note: "Ants living in the stalks of *Papyrus* and making carton nests in their crowns. The workers swarm out in great masses and let themselves drop on the intruder. They bite furiously and it is difficult to get rid of them, as they work themselves upward on the body, attacking by preference the softer parts of the skin."[1]

Crematogaster (Sphærocrema) bequaerti (Forel) variety **atraplex** Santschi, new variety

"WORKER.—Length 4 mm. Rather dull yellow; gaster, postpetiole and femora yellowish brown; tips of the epinotal spines brownish black. In other respects like the type of the species and the var. *mutabilis* (Santschi), but the median impression of the pronotum is feebler. The dark tips of the spines contrast with the pale color of the thorax." (Santschi)

A dozen workers from Yakuluku (Lang and Chapin).

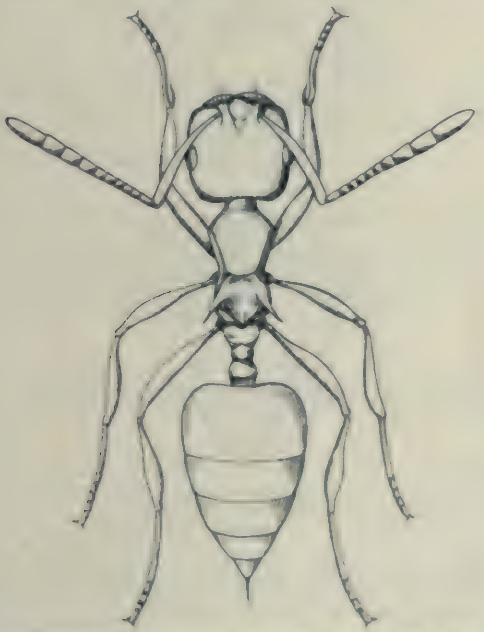

Fig. 38. *Crematogaster (Sphærocrema) concava* Emery. Worker from above.

Crematogaster (Sphærocrema) concava Emery

Text Figure 38

Akenge, ☿; Stanleyville, ☿; Lukolela to Basoko, ☿ (Lang and Chapin). The specimens from Stanleyville were taken in twigs of *Barteria fistulosa* (Part IV); those from Lukolela were found running over fire-wood. Three specimens from Akenge were taken from the stomach of a toad (*Bufo polycercus*).

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[1] Santschi has recently described a variety *pluton* of this race, collected by Dr. Bequaert from similar carton nests in the crowns of *Papyrus*, at Zambi.

Crematogaster (**Sphærocrema**) **pronotalis** Santschi variety **liebknechti** (Forel)

Text Figure 39

Numerous workers from Yakuluku and Garamba (Lang and Chapin). According to a note accompanying the specimens from the latter locality, this ant "builds small carton nests on the blades of grass. It is common in swamps, from three to five feet above water level."

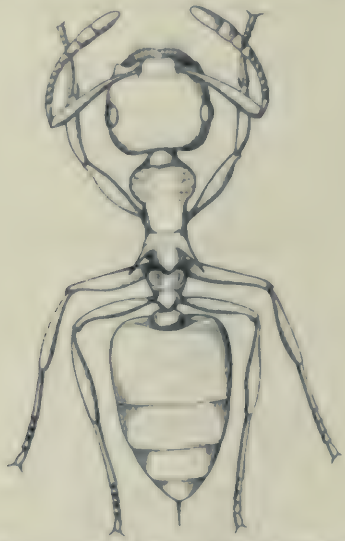

Fig. 39. *Crematogaster (Sphærocrema) pronotalis* variety *liebknechti* (Forel). Worker from above.

Crematogaster (**Sphærocrema**) **rugosior** (Santschi)

"Female (undescribed).—Length 8 mm. Thorax smooth and shining like the posterior half of the head and that of the worker, except its upper surface and the sides of the epinotum which have rugæ as in the worker. Head rectangular, a little longer than broad, scarcely arcuate laterally. The eyes occupy nearly the middle third of the sides and the scapes barely extend beyond its posterior fourth. Clypeus with a strong median impression near its anterior border. Thorax as broad as the head. Epinotum nearly vertical, but the insertion of the spines is marked by an angular ridge which occupies nearly the upper half of the sides of the segment. Petiole as in the worker, with a tooth beneath. Wings 7 mm. long, hyaline, with brownish veins. Otherwise like the worker." (Santschi)

Numerous workers and a few females from Stanleyville (Lang, Chapin, and J. Bequaert), without further data.

Crematogaster (**Sphærocrema**) **striatula** Emery variety **obstinata** (Santschi)

Numerous workers taken by Dr. Bequaert at Leopoldville in the peculiarly inflated stipules of a species of *Uragoga*, a rubiaceous plant (Part IV). The spaces inhabited by the ants are not true nests but merely kraals or stables for Coccidæ, as no larvæ or pupæ were found in the structures.

Crematogaster (**Atopogyne**) **africana** (Mayr) variety **schumanni** (Mayr)

A number of workers taken by Dr. Bequaert at Leopoldville in the hollow stems of a *Barteria Dewevrei* (Part IV).

Crematogaster (**Atopogyne**) **africana** subspecies **laurenti** (Forel)

Numerous workers taken by Dr. Bequaert in the Rain Forest on the Tshopo River, near Stanleyville, in the hollow stems of *Plectronia Laurentii* (Part IV).

Crematogaster (**Atopogyne**) **africana** subspecies **laurenti** variety **zeta** (Forel)

Many workers and a few females taken by Dr. Bequaert at Pale (Niembo, between Walikale and Lubutu) from the myrmecodomatia of *Plectronia Laurentii* (Part IV) and at Leopoldville in the rudimentary leaf pouches of *Randia physophylla* (Part IV); also by Lang and Chapin at Stanleyville in the stem cavities of *Cuviera angolensis* (Part IV.)

The female of this form is black and striated as in the typical *C. africana*.

Crematogaster (**Atopogyne**) **africana** subspecies **tibialis** Santschi, new subspecies

"WORKER.—

"Length 3.5 mm.

"Pale castaneous. Epinotum, postpetiole, and posterior half of gaster of a deeper castaneous tint, passing to reddish brown. A spot on the vertex and the appendages dark brown, the tibiæ and metatarsi blackish, the tarsi and the extremity of the thorax reticulate, the epinotum more finely, with some fine longitudinal rugæ on the whole basal surface. Sides of the mesonotum regularly reticulate-punctate. Sides of the pronotum more shining and of the epinotum longitudinally striate. Petiole finely reticulate; gaster finely shagreened, almost smooth. The pubescence is rather well developed on the head, the gaster, and the appendages, sparse on the thorax. The hairs are very sparse, except around the mouth and at the tip of the gaster. Head square, with rather convex sides and straight posterior border. Eyes at the middle of the sides. Frontal area short, feebly impressed behind. Frontal carinæ developed. Clypeus slightly convex, with rather arched anterior border. Mandibles striate-punctate, with four blackish teeth. The pronotum forms with the basal surface of the mesonotum a plane surface with a contour like that of *C. castanea* Smith. Sides of the basal surface of the mesonotum blunt, not marginate, with the anterior eminence scarcely indicated. Promesonotal suture little or not at all impressed. Sides of the pronotum marginate. Declivity of mesonotum oblique, feebly concave from right to left, above with marginate sides. Mesoëpinotal furrow moderately deep. Basal surface of epinotum trapezoidal, its length equal to its width anteriorly in the small worker. It is convex in front, more feebly behind. The spines are as short as a fifth of the interval between their bases, which is concave. They are directed backward and slightly outward. Declivity as long as two-thirds of the basal surface and forming with it an angle of about 145°. Petiole trapezoidal, as broad as long, and as broad as the epinotum. Last antennal joint reddish. A fine and dense striation disposed as in *africana* (Mayr) but more or less effaced on the front, vertex and occiput, where the reflection is more shining than silky. Epinotum transversely striate-rugose. Petiole smooth, postpetiole and gaster very finely shagreened, almost shining. The head is, moreover, punctate as in *africana* and much less smooth in the individuals with large head.

"The head, which varies in size independently of the rest of the body, which is almost invariable, is sometimes longer than broad and scarcely emarginate behind, sometimes broader than long, strongly concave behind and with convex sides. Eyes more posterior than in *africana*. Frontal area narrow, strongly impressed and shining. Mandibles punctate, feebly striate. Mesoëpinotal impression stronger than in *africana*, the pronotum less marginate anteriorly. Mesonotum carinate, more elongate and with the declivous surface much less abrupt than in *africana*, with longer epinotal spines, even longer than in the variety *variegata* (Mayr) and a little farther apart. Petiole and postpetiole as in *africana*." (Santschi)

Numerous workers taken at the village of Mosekowa between Walikale and Lubutu by Dr. Bequaert from the peculiar pouches of *Macaranga saccifera* (Part IV) growing in the Rain Forest. As only adult ants and no brood were found in the pouches, Dr. Bequaert does not regard them as true nests. The openings of the pouches were not closed with fibrous carton.

Crematogaster (**Atopogyne**) **africana** subspecies **winkleri** (Forel) variety **fickendeyi** (Forel)

Numerous workers taken by Dr. Bequaert at Masongo, between Walikale and Lubutu, in the cavities of the branches of a species of *Sarcocephalus* related to *S. sambucinus* (Part IV).

Crematogaster (**Atopogyne**) **depressa** (Latreille) variety **fuscipennis** Emery

Plate X

Stanleyville, ♀; Medje, ☿, ♀; Niapu, ☿; Ambelokudi, ☿, ♀; Niangara, ☿ (Lang and Chapin); Leopoldville, ☿ (J. Bequaert).

The beautiful carton nest of this ant is shown in Plate X, from a fine photograph taken by Mr. Lang at Ambelokudi. "It was built along the trunk of a tree near the ground. The ants, especially when squeezed, gave off a stench like certain bugs. They came out of the nest in great numbers and let themselves drop to the ground."

The female *C. depressa* is very aberrant in the form of the head, which is large, flat, and rectangular, with peculiar mandibles. It has long been known and has been repeatedly renamed, but only recently has it been correlated with the cospecific worker.

Crematogaster (**Atopogyne**) **theta** (Forel)

Plate XI, Figures 1 and 2; Plate XII, Figures 1 and 2; Plate XIII, Figure 1

Medje, ☿; Avakubi, ☿; Stanleyville, ☿, ♀, ♂ (Lang and Chapin).

According to Santschi (*in litt.*), "this form represents the extreme limit of the subgenus *Atopogyne*. The worker has a feeble groove on the postpetiole, and the promesonotal impression is feeble. Moreover, the female is brown, smooth, and shining, with spined epinotum, very different from the female of *C. africana* (Mayr) and the variety *zeta* (Forel)."

The specimens from Avakubi were collected by the natives, who call this ant "lona." The carton nests are shown in PlateXI and XII. Concerning the specimens from Stanleyville, Mr. Lang writes: "These small black ants are very common. They build carton nests in trees, on the trunks of which they travel up and down in uninterrupted columns. At the slightest disturbance the nest is covered with workers. They appear and move so rapidly that it is very difficult to study them, especially as they sting disagreeably. Large numbers of nests may be found in the same tree, sometimes as low as ten feet from the ground, or even in bushes as well as in the tops of the tallest trees, living or dead. They have almost any shape, depending on their position, whether in forks of the branches or about twigs. In the latter situations they resemble mere lumps. The more regular nests, however, are somewhat conical, like the tops of termite hills and are placed upright on the boughs. In color, the carton is grayish or dark brown. In size, the structures are rarely more than two feet in height and about a foot in diameter. Their cells are irregular.

the walls of the chambers being from 1 to 3 mm. thick, and there are many entrances and exits. Though very light, the nests are so tough that slices can be chopped off with a hatchet without breaking the remainder. The carton seems to be made from the fibres of rotten leaves worked up with secretions from the oral glands of the workers. The chambers are often full of brood, which is not confined to any particular part of the nest. The rufous females were present in such numbers that twenty or more could be lifted at a time clinging to one another on the points of the tweezers."

Crematogaster (Atopogyne) transiens (Forel)

A few workers from Avakubi and a female from Stanleyville (Lang and Chapin).

Crematogaster (Nematocrema) stadelmanni (Mayr)

A single female from Stanleyville (Lang and Chapin), apparently taken at light, seems to be referable to this, the typical form of the species.

Crematogaster (Nematocrema) stadelmanni variety **dolichocephala** (Santschi)

Plate XIII, Figure 2 and Plate XIV

Bengamisa, ☿, ♀; Manamana, ☿, ♀; Kwamouth, ☿; Ngayu, ☿, ♀ (Lang and Chapin). Numerous specimens from all these localities. The specimens from Bengamisa were accompanied by the photograph of the nest shown in Plate XIV, and the following note: "Ants from a pendent nest in very hard, woody carton. These nests are very common in the Rain Forest. They often fall to the ground but, in spite of the great moisture, resist disintegration fairly well. The ants leave as soon as the nest has dropped. The nests are precisely like those of some termites in shape and material, so that it is often impossible to decide from their external appearance which insect inhabits them. The internal cellular structure is very irregular and seems to follow no particular plan. The larvæ and pupæ are found in any of the cavities. The nest represented in the photograph was fixed to several creepers and was practically swaying in the wind about twenty-five feet above the ground. Size and shape vary much according to the situation of the structure." The following note accompanies the specimens from Kwamouth, together with the photograph shown in Plate XIII, fig. 2: "Black ants taken from a nest hanging on a tree about nine feet from the ground. This nest was cone-shaped and was fastened to several small branches in such a manner as to sway when it was struck with a stick. The ants raise their abdomens and sting quite furiously when annoyed. The nest is rough on the outside and very irregular, with a great many exits. The internal cellular structure resembles crumpled leaves overlapping one another like the shingles covering a roof. The walls separating the chambers are very thin, only one-eighth to one-sixteenth of an inch in thickness. The whole of the nest that was photographed was about eighteen inches long and eleven inches broad on top. The brood was abundant in the lowermost chambers. The ants dropped by hundreds to the ground when the nest was hit."

MONOMORIUM Mayr

The numerous species of this large and difficult genus are all small but form populous colonies, commonly with several fertile females.

The WORKER is usually monomorphic, in the subgenera *Parholcomyrmex* and *Holcomyrmex* tending more or less to dimorphism. Clypeus abrupt, not sharply marked off from the frontal area, with two longitudinal welts or ridges often bordering an impressed median area and terminating anteriorly in projections or teeth. (These welts are fused in the subgenus *Syllophopsis*). Mandibles narrow, with few teeth. Maxillary palpi 1- to 2-jointed, labial palpi 2-jointed. Antennæ 12-jointed, in a few subgenera 11-jointed, in one species (*M. decamerum*) 10-jointed, the club typically 3-jointed, but sometimes 4-jointed or indistinct. Promesonotal suture obsolete, the mesonotum more or less impressed at the mesoëpinotal suture, the epinotum nearly always unarmed. Petiole pedunculate, with high node; postpetiole lower, rounded. Tibial spurs simple or lacking.

The FEMALE is always much larger than the worker, in some species wingless; in one Australian form (*subapterum*) with vestigial wings. Venation like that of *Formica*, with a discoidal cell, rarely without.

The MALE is smaller than the female, always winged, with 13-jointed antennæ. Mesonotum usually without Mayrian furrows, genital appendages completely retractile.

The division of the genus was begun by Forel when he established the subgenus *Martia*. Emery[1] has recently revised the grouping of species and has established several additional subgenera. Viehmeyer has also proposed a subgenus *Corynomyrmex*, and Santschi has since added the subgenera *Syllophopsis* and *Isolcomyrmex*. In a more recent paper,[2] Santschi proposes to give *Syllophopsis* generic rank.

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[1] 1913, Ann. Soc. Ent. Belgique, LVIII, p. 261; and Bull. Soc. Ent. France, 1915, p. 190.

[2] 1921, Ann. Soc. Ent. Belgique, LXI, p. 120.

These subgenera (see the key, Part VII) may be arranged more or less according to their natural affinities in the following sequence:

1. *Anillomyrma* Emery
2. *Martia* Forel
3. *Lampromyrmex* Mayr (= *Mitara* Emery)
4. *Chelaner* Emery
5. *Adlerzia* Emery
6. *Syllophopsis* Santschi
7. *Monomorium, sensu stricto*
8. *Notomyrmex* Emery
9. *Xeromyrmex* Emery
10. *Parholcomyrmex* Emery
11. *Isolcomyrmex* Santschi
12. *Holcomyrmex* Mayr
13. *Corynomyrmex* Viehmeyer

The genus *Monomorium*, though cosmopolitan and of even wider distribution than *Crematogaster* since it occurs even in New Zealand and Patagonia, is represented by the great majority of species in the Old World. The Neotropical Region possesses only a few species of the typical subgenus *Monomorium* and the species of *Martia*, which are not known to occur elsewhere. The subgenera *Notomyrmex*, *Adlerzia*, and *Chelaner* are exclusively Australian. *Anillomyrma* is monotypic and known only from Ceylon. *Isolcomyrmex* and *Syllophopsis* are exclusively Ethiopian. *Xeromyrmex* is properly African but spreads into the Palearctic and Indian Regions. *Holcomyrmex*, *Parholcomyrmex*, and especially *Monomorium, sensu stricto*, are more widely distributed. Several of the species of *Monomorium, sensu stricto*, (*minutum*, *floricola*, *pharaonis*), *Xeromyrmex* (*salomonis*), and *Parholcomyrmex* (*gracillimum*, *destructor*) have been widely disseminated by commerce. The species of *Holcomyrmex* are harvesting ants of dry regions and this is true of certain Australian species which are allied to *Parholcomyrmex*, though I assign them to a new subgenus **Protholcomyrmex** (with the type *Monomorium rothsteini* Forel) to be described in a later paper.

Monomorium pharaonis (Linnæus)

Numerous workers and females from Stanleyville and Thysville (Lang and Chapin). This is the well-known, little, red house ant, spread by commerce throughout the world.

Monomorium (Xeromyrmex) bicolor Emery

Several workers from Leopoldville (Lang and Chapin), found "living beneath a log," and two from Garamba, taken from the stomach of a toad (*Bufo regularis*). This species is apparently widely distributed in the Ethiopian Region.

Monomorium (Xeromyrmex) afrum Ern. André variety **fultor** Forel

Many workers from Niapu and Garamba (Lang and Chapin). Those from Niapu "came in thousands to the body of a dead bird. They had their nest in a cleared place about thirty yards away. The following day they had moved their nest to the base of a decomposed root but towards evening had returned to their original nest. This extended about two feet below the surface of the soil." At Garamba the species was found "making crater nests about three inches high about the stalks of grasses in a dry plain (savannah) with few trees." Thirteen specimens from this locality were taken from the stomach of a toad (*Bufo regularis*).

Monomorium (Parholcomyrmex) gracillimum (F. Smith) subspecies **robustius** Forel

Several workers from Yakuluku (Lang and Chapin); found living in small mushroom-shaped termitaria. The typical form of the species is widely distributed in Asia Minor, Arabia, Central Asia, India, etc., and is evidently spreading to other parts of the Old World tropics (Africa, Java, Laysan, etc.). According to Emery, it occurs in the desert of Algiers, nesting under stones. The subspecies *robustius* was originally described from Somaliland. Yakuluku is in the dry portion of the Belgian Congo towards the type locality.

SOLENOPSIS Westwood

A large and difficult genus of mostly hypogæic ants; usually with very small, pale workers and much larger and dark-colored females and males.

The WORKERS are usually monomorphic but in a few species, such as *punctaticeps* Mayr, *sævissima* (Smith) and *geminata* (Fabricius), distinctly polymorphic. Antennæ 10-jointed, first funicular joint large, club large, distinctly 2-jointed, the last joint very long. Mandibles narrow, with few (usually 4) teeth. Clypeus raised in the middle and projecting anteriorly, with two diverging ridges, or carinæ, each in all but a few species terminating anteriorly in a strong tooth flanked by a smaller tooth on the side. Frontal carinæ short, somewhat diverging behind. Eyes small, often minute or vestigial; ocelli very rarely present. Promesonotal suture indistinct, mesoëpinotal suture well developed. Thorax more or less impressed at the latter. Epinotum always unarmed. Petiole with short peduncle and high, rounded node; postpetiole rounded, much lower than the petiolar node.

The FEMALE has 11-jointed (rarely 10-jointed) antennæ and moderately large eyes and ocelli. Fore wings with one cubital and one discoidal cell; radial cell open.

The MALE is somewhat smaller than the female, with 12-jointed antennæ. Scape very short, first funicular joint globular. Eyes and ocelli very large and prominent. Mesonotum without Mayrian furrows. Postpetiole campanulate; first gastric segment large; legs slender.

The genus *Solenopsis* is cosmopolitan, but represented by the greatest number of species in the Neotropical Region. There are a few forms even in Australia. The species with small, nearly blind, yellow workers, like *S. fugax* (Latreille) of Eurasia and *S. molesta* (Say) of North America, are hypogæic and usually live in the nests of other ants and termites, feeding on their brood (cleptobiosis). Some species, however, (*punctaticeps*, *sævissima*, *geminata*, *gayi*, etc.) live in large independent colonies. *S. sævissima* and *geminata*, the well-known "fire-ants" of the tropics, sting very severely. They have well-developed eyes and lead an epigæic life, not only feeding on insects and other animal food but also harvesting seeds or destroying the tender shoots or fruits of plants.

Solenopsis punctaticeps Mayr subspecies **kibaliensis,** new subspecies

WORKER.—

Length 2 to 2.8 mm.

Apparently less polymorphic than the typical *punctaticeps* and the subspecies *caffra* Forel and therefore more like the subspecies *erythræa* Emery. Head in all the individuals rectangular, with straight sides, as broad in front as behind, not longer than broad in the largest, distinctly longer in the smallest individuals. Median teeth of the clypeus long and slender, lateral teeth obsolete or indicated only by feeble projections. Petiolar node broader than the petiole, its upper border straight and transverse.

Sculpture much as in typical *punctaticeps* and the hairs almost as abundant as in that form, but much shorter and less erect, especially on the head. Color yellowish brown, legs and antennæ yellow; mandibular teeth dark brown. Small workers scarcely paler.

MALE.—

Length 4.3 mm.

Head with very large eyes and ocelli, the latter extremely prominent; without the mandibles broader than long. Mandibles with 3 denticles. Antennal scapes nearly as long as the first two funicular joints together. Thorax broadly elliptical, slightly flattened above, only slightly longer than broad, much broader than the head. Epinotum bluntly subangular in profile, the base distinctly longer than the declivity. Nodes of petiole very low, rounded. Wings rather long; legs very slender.

Smooth and shining; head subopaque and finely longitudinally striate behind. Hairs sparser and more reclinate than in the worker.

Brown; head black around the ocelli; mandibles, antennæ and legs yellowish. Wings rather opaque brownish hyaline, with very distinct brown veins and pterostigma.

Described from twenty workers and a single male from Vankerckhovenville (Lang and Chapin), on the Kibali River or Upper Uele. The specimens were living in small craters in the soil and were seen feeding on dead insects.

Emery[1] has recently revised the various subspecies and varieties of *S. punctaticeps*. The form described above is certainly distinct. I am not sure that I have seen the largest workers, although the series of specimens is rather large. The single male is smaller and much paler than that of the typical *punctaticeps*, which is described by Arnold as "black" and as measuring 5 mm. He found that the typical form of the species lives in large colonies, independent of other ants or termites, though it is hypogæic, "rarely coming to the surface except in dull weather."

AËROMYRMA Forel

In this genus the WORKER phase is strongly dimorphic, being represented by a minute worker proper and a much larger soldier, both with 10-jointed antennæ and distinctly 2-jointed antennal club. The head of the soldier is large, suboblong and, in some species, furnished with a ridge with a slight tooth-like projection on each side near the occipital border. Maxillary and labial palpi 2-jointed. Mandibles 5- or 6-toothed. Clypeus without teeth and usually without carinæ. Eyes reduced to a few facets, the anterior ocellus well developed, the lateral ocelli absent. Pro- and mesonotum high and convex; epinotum short, unarmed or with small teeth. Promeso- and mesoëpinotal sutures distinct. Petiole with a short peduncle, its node rather low and transverse; postpetiole also transverse, somewhat broader than the petiole. Gaster large, elongate, as long as the remainder of the body. Legs short. In the worker the head is small, scarcely longer than broad, without ocelli and with the eyes even more reduced than in the soldier, the gaster smaller, not elongate.

FEMALE larger than the soldier, but with shorter head. Antennæ 11-jointed, but also with a 2-jointed club. Thorax elongate elliptical, mesonotum seen from above covering the pronotum. Wings long, with a closed radial cell, a discoidal and one cubital cell.

MALE smaller than the female, not larger than the soldier, with long, filiform, 13-jointed antennæ, the scape very short, the first funicular joint not swollen, not broader than the succeeding joints. Outer genital valve long, narrow, acuminately rounded at the tip; middle valve with a short, hollow, subtriangular, external ramus, and an extremely narrow, rather long internal ramus terminating in a hook; inner valve with three ridges, the mesial of which is strongly dentate and with its point directed obliquely to the base of the valve.

The genotype, *A. nossindambo* Forel, was described from males and females taken in Madagascar many years ago. Sikora later found the soldiers and workers in a termitarium at Amparafaravantsiv in the same island. Forel therefore expressed the opinion that the species of *Aëromyrma* must be cleptobiotic. The fact that Emery found a worker attached to the tarsus of a female is suggestive in connection with conditions in *Carebara* (*vide infra*, p. 171).

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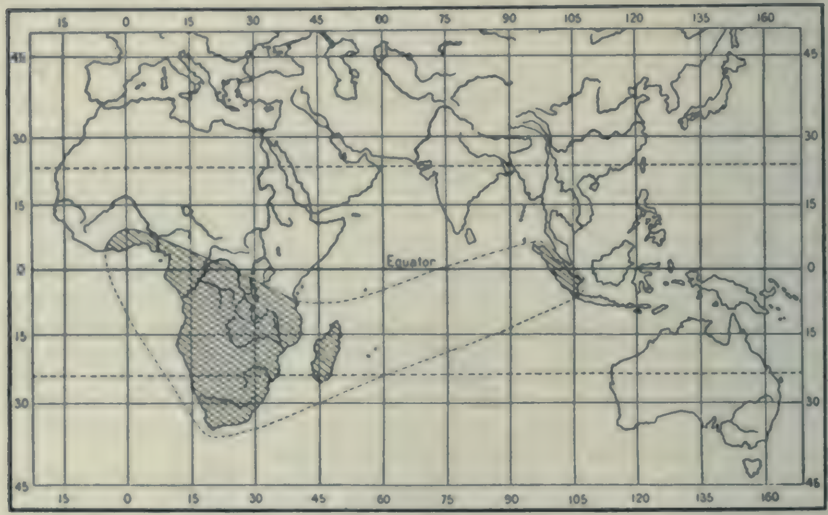
[1] 1915, Rend. Accad. Sc. Bologna, N. S., XIX, pp. 60–65.

For many years the genus was supposed to be monotypic and peculiar to Madagascar, but within recent years eight species and a variety have been described from the Ethiopian Region; Forel has also described a species from Sumatra (Map 23). A single soldier in the collection made by Lang and Chapin is certainly different from any of the species known in that phase. I describe it as new, although it may prove to be the soldier of one of the species based on workers.



Map 23. Distribution of the genus *Aëromyrma*.

Aëromyrma petulca, new species

Text Figure 40

Soldier.—

Length 2.5 mm.

Head suboblong, nearly one and one-half times as long as broad, with feebly convex sides and rather deeply and angularly excised posterior border. Anterior ocellus well developed; eyes very small, consisting of about six ommatidia, situated at the anterior third of the head. Posterior corners of the latter with a low but distinct ridge produced on each side into a minute tooth. Mandibles convex, with 4 small, subequal, rather acute apical teeth, and a large blunt and flattened basal tooth. Clypeus flat, ecarinate, its anterior border feebly and sinuately excised in the middle, its posterior portion narrow, rectangular, extending back between the diverging frontal carinæ. Frontal groove distinct. Antennæ 10-jointed; scapes rather slender and curved at the base, reaching to the middle of the sides of the head; joints 2 to 7 of the funiculus minute, subequal, nearly as broad as long (somewhat too long in the figure); club a little shorter than the remainder of the funiculus, with the basal joint longer than broad and about one-third as long as the terminal joint. Thorax decidedly shorter and narrower than the head; pro- and mesonotum convex, steep in front, rounded above; promesonotal suture distinct; mesonotum subcircular; metanotal sclerite distinct. In profile the dorsal outline of the mesonotum slopes backward continuously with the base of the epinotum without a distinct impression at the mesoëpinotal suture. Epinotum with a small tooth on each side, its declivity longer than its base, rather steeply sloping. Petiolar node compressed anteroposteriorly, in profile with a rather angular summit, from above transverse; postpetiole transversely elliptical and somewhat broader than the petiole, with a blunt ventral tooth. Gaster voluminous, distended with a transparent liquid, elongate elliptical, longer than the remainder of the body, its anterior border straight in the middle. Legs short.

Subopaque; mandibles, posterior portion of clypeus, frontal area, mesonotum, and gaster shining; mandibles sparsely and indistinctly punctate; head finely and regularly longitudinally rugulose; sparsely and rather coarsely punctate posteriorly; gaster with fine, scattered, piligerous punctures.

Hairs yellowish, moderately abundant, suberect, of uneven length, most conspicuous on the dorsal surface; very short, dense and appressed on the appendages.

Ferruginous red; legs and antennæ paler and more yellowish; gaster dark brown above, with the venter and bases and apical borders of the segments broadly yellowish.

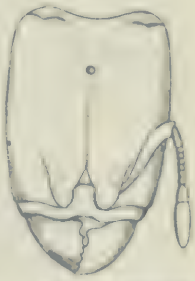


Fig. 4. *Aëromyrma petulca*, new species. Head of soldier from above.

Described from a single specimen taken by Lang and Chapin at Malela "from a small mushroom-shaped termitarium," probably belonging to a colony of *Eutermes fungifaber* Sjöstedt.

A. petulca differs from *africana* Forel from the Kalahari in its slightly smaller size, darker color, in having the postpetiole only slightly broader than the petiole (nearly twice as broad in *africana*), in possessing epinotal teeth and longitudinal rugæ on the head. In *africana* the head is finely reticulate and the remainder of the body is evidently more shining than in *petulca*. In *nossindambo* the head is broader and less sharply rugulose, the thorax is more deeply impressed at the mesoëpinotal suture, the antennal scapes are much shorter, the anterior ocellus is smaller and the color is paler.

Forel states that the gaster of the *africana* soldier is "transparent yellow," which indicates that it was full of a clear liquid as in *petulca*. This condition is seen also in the soldiers of many species of *Pheidole* in Australia and in our Southern States and seems to indicate that this caste in the two genera mentioned often functions as replete or food-storage individuals as in the honey ants (*Myrmecocystus*, *Leptomyrmex*, *Melophorus*, *Plagiolepis*, and *Prenolepis*).

Emery[1] believes that *Aëromyrma* should be reduced to the rank of a subgenus under *Oligomyrmex* "because in *O. debilis* Santschi the worker has 9-jointed, whereas the soldier (and probably also the female) has 10-jointed antennæ, so that if one wished to distinguish the groups as heretofore, the worker of *O. debilis* would be classified in the genus *Oligomyrmex*, the soldier in the genus *Aëromyrma*." While admitting that the two genera are very closely related, I prefer to retain *Aëromyrma* as an independent genus until the species are better known. Probably there are important differences in habit between the species of the two groups. At any rate, *A. nossindambo* and *petulca* are cleptobiotic with termites, whereas two or three species of *Oligomyrmex* which I collected in Australia were always found nesting in small cavities in rotten logs quite apart from termites.

Aëromyrma species

A single winged female from Akenge, taken from the stomach of a frog (*Arthroleptis variabilis*), cannot at the present time be referred to any of the described species, mostly known from soldiers and workers.

CAREBARA F. Smith

WORKER minute, monomorphic, yellow, without eyes or ocelli; antennæ 9-jointed, joints 2 to 6 very small, the two terminal joints forming a large and distinct club, with very long last joint. Mandibles with oblique 3- or 4-toothed apical margins. Frontal carinæ short; frontal groove and frontal area absent. Clypeus simple, unarmed, without carinæ. Epinotum unarmed. Petiole with a short peduncle, its node higher and larger than that of the postpetiole; both nodes from above transverse, subelliptical.

FEMALE enormously larger than the worker, dark-colored, with well-developed eyes and ocelli. Antennæ short, 10-jointed, the funiculi without a distinct club, their joints 2 to 5 not much narrower than the remaining joints. Thorax large and robust, convex above, higher than the head, the mesonotum anteriorly more or less overarching the small pronotum, with well-developed parapsidal furrows. Epinotum unarmed, or with low flattened lobes or protuberances on the sides. Tarsi densely clothed with short, stiff bristles. Wings large, the anterior pair rather pointed, with one cubital, a discoidal, and a closed radial cell and a well-developed pterostigma.

MALE somewhat smaller than the female, but similarly colored, with long, 13-jointed antennæ, scapes short, first funicular joint not swollen nor globular, remaining joints long and cylindrical. Mesonotum large, without Mayrian furrows. Nodes of petiole and postpetiole only feebly developed.

The genus *Carebara* (Map 24) is represented by seven species in the Ethiopian and two in the Indochinese Region (*C. lignata* Westwood and *C. castanea* F. Smith). Santschi described some females and males taken in French Guiana as *Carebara carinata*.[1] The former measure 12 to 12.8 mm., the latter 9.3 mm. He is of the opinion that the species hitherto referred to the Neotropical genus *Tranopelta*, originally founded by Mayr on male specimens, are also to be referred to *Carebara*. Forel, however, in his description of the workers of *T. gilva* Mayr variety *brunnea* shows that Mayr's genus is perfectly distinct. These workers are somewhat dimorphic, have eyes, and both the workers and females have 11-jointed antennæ, with a 3-jointed clava. The male alone is very similar to *Carebara*, especially to the male of *C. osborni* described below. These characters are all evident in a series of worker, male and female cotypes of *brunnea* in my collection. Emery[2] had previously based another Neotropical genus, *Carebarella*, on females and males of a species (*C. bicolor*) from Brazil and Peru. He also described a worker from Ega, Brazil, under the name *Oligomyrmex anophthalmus*.

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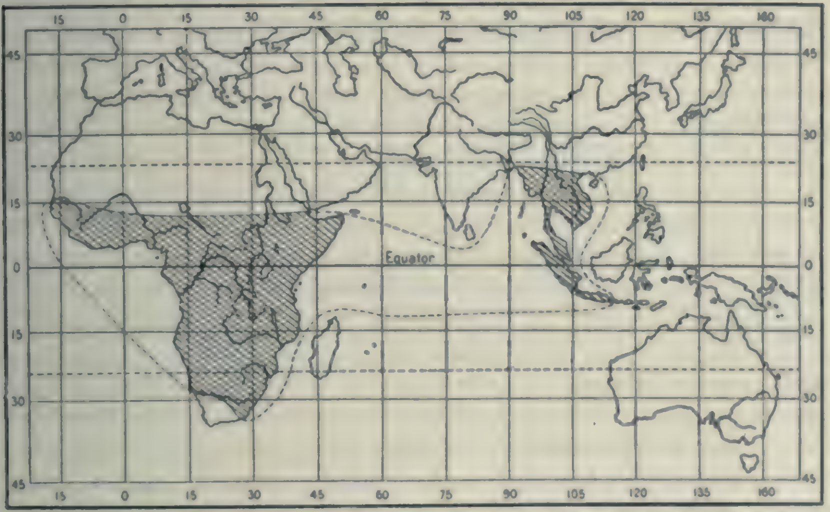
[1] 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 59, footnote.



Map 24. Distribution of the genus *Carebara* in the Old World. This genus also occurs in South America.

At first sight the occurrence of species of *Carebara* and *Oligomyrmex* in South America seems very doubtful. During a recent trip to British Guiana I was able to secure all three phases of a new subspecies of Santschi's *C. carinata* and of the typical form of *Tranopelta gilva*. The worker of the former shows that it is without a doubt a true *Carebara*, and Prof. Emery, to whom I sent specimens for comparison with his *Oligomyrmex anophthalmus*, writes me that the latter, though specifically distinct, belongs to the same genus. It should therefore be known as *Carebara anophthalma*. The new subspecies of *carinata* was taken in a large termitarium of *Syntermes dirus* Klug, and it is interesting to note that of all the Neotropical termites this is most like the large *Termes* species with which the Ethiopian *Carebaræ* live (*vide infra*). I took *Tranopelta gilva*, however, in the deeper parts of the nest of the large ponerine, *Paraponera clavata* (Fabricius), and also living independently with coccids under bark.

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[1] 1912, Bull. Soc. Ent. France, p. 139.

[2] 1905, Bull. Soc. Ent. Italiana, XXXVII, p. 137

Emery has placed *Tranopelta* and *Carebarella* with *Diplomorium* and *Solenopsis* in the tribe Solenopsidini and has made a tribe Pheidologetini for the genera *Pheidologeton*, *Aneleus*, *Lecanomyrma*, *Oligomyrmex* (including the subgenera *Aëromyrma* and *Octella*), *Erebomyrma*, *Pædalgus*, and *Carebara*. It would seem to be more natural to include all these forms in the single tribe Solenopsidini. Evidently *Carebara*, in the diminution of the antennal joints and the loss of the eyes in the worker, in the secondary reduction of this caste to monomorphism, and the secondary enormous enlargement of the females and males, represents the most extreme development of the whole series of genera, which probably started from forms like the existing species of *Pheidologeton*. Since the volumes of bodies of the same shape vary as the cubes of their diameter, a female *Carebara vidua* measuring 24 mm. would be 4096 times as large as the cospecific worker, which measures only 1.5 mm., if the two insects were of the same shape. But the female is a much stouter insect in proportion to her length than the worker, so that she must be nearly 5000 times as large. And this disproportion occurs not only among individuals of the same species but of the same sex and among the offspring of the same mother! The only other insects which exhibit a like disproportion are the workers and physogastric queens of the very termites with which *Carebara* lives as a predatory parasite. The extraordinary differences in stature between the workers and sexual phases of *Carebara* are undoubtedly correlated with interesting habits of the species. Haviland[1] was the first to show that *C. vidua* lives in the masonry of the large nests of *Termes natalensis* in Natal. He discovered the minute workers but was unable to elucidate the relations of the ants to the termites. Forel (*loco citato*), inferring from analogy with our northern cleptobiotic species of *Solenopsis* (*S. fugax*, *molesta*, etc.) advanced the hypothesis that the *Carebara* colonies live in cavities of their own in the masonry of the termitaria and that these cavities are connected with the galleries of the termites by means of very tenuous passages through which the *Carebara* workers, but not the termites, can pass. The *Carebara* workers, probably remaining unnoticed on account of their small size, prey on the termites with impunity and are therefore able to rear such huge sexual forms. The larvæ of these are so voluminous that they could not be moved by the workers and are so soft and vulnerable that they would have to be reared in chambers inaccessible to the termites. Although no detailed observations on the relations of the two species have been published, the subsequent accounts of observers in the field go to confirm Forel's inferences.

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[1] In Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 392.

Bequaert[1] has witnessed the marriage flight of *Carebara junodi* Forel. He says:

> This species is remarkable on account of the extraordinary disproportion between the female and the workers. In the Katanga it lives in the mound-shaped nests of *Acanthotermes spiniger*. October 6, 1911, I witnessed at Sankisia a nuptial flight of this ant. It was at the very beginning of the rainy season and on the two preceding days it had rained abundantly. Toward noon numerous winged females were flying about everywhere in the savannah; they came from a certain number of termitaria, the sides of which were covered with fabulous numbers of the very small workers of the same species. I did not see copulation but, in the evening, I captured several males at light but no females. The following days the phenomenon was not repeated.
>
> The huge *Carebara* females are, among the aborigines of the Congo, a much-sought-for delicacy. Hence they take advantage of the nuptial flight to collect a great number of individuals. The swollen portion of the abdomen alone is utilized. They eat it either roasted or raw.

Dr. Bequaert informs me that his attention was directed to the marriage flight described above by the excitement of the congregated natives who were actually filling pails with the torn-off gasters of the females. Each *Carebara* colony gave off hundreds of females and the number of workers that covered a termitarium during the flight must have run into the millions. The workers of *Carebara*, like those of other hypogæic ants (*Erebomyrma*, *Acanthomyops*, etc.), apparently come to the surface of the soil only while the nuptial flight is in progress.

Arnold[2] adds the following interesting note to his description of *Carebara vidua*.

> It is probable that the dense tufts of hairs on the tarsi of the female serve an important purpose—that of enabling some of the minute workers to attach themselves to the body of the female when the latter is about to leave the parental nest. Several specimens of the female have been taken by me with one or more workers biting into

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[1] 1913, Rev. Zool. Afr., II, p. 428.
[2] 1916, Ann. South African Mus., XIV, p. 252.

the dorsal fimbriæ. I am inclined to suspect that the young queen cannot start a new nest without the help of one or more of the workers from the old nest, on account of the size of her mouth-parts, which would probably be too large and clumsy to tend the tiny larvæ of her first brood, and that it is therefore essential that she should have with her some workers which are able to feed the larvæ by conveying to them the nourishment from the mouth of the queen.

I find that the workers also attach themselves to the tarsi of the males. Two specimens of this sex referable to *C. vidua*, evidently taken at light and sent me by Mr. C. C. Gowdey from Kampala, Uganda, each bear two workers firmly attached by their mandibles to the tarsal hairs. Such workers must, of course, perish with their carriers, unless they can manage to pass over to the legs of the females during copulation.

The workers and females of the African *Carebaræ* can be separated by means of the following keys.

FEMALES

1. Large species, more than 20 mm. long..2.
   Small species, not more than 15 mm. long..4.
2. Mandibles with only 2 teeth and the remainder of their apical borders undulated, not properly dentate..*ampla* Santschi.
   Mandibles with more than 2 teeth, entire apical border dentate..3.
3. Black; the gaster sometimes red; mesonotum about as broad as long; clypeal border not emarginate in the middle; hind metatarsi much shorter than hind tibiæ..*vidua* F. Smith.
   Dull rusty red; mesonotum with three dark brown longitudinal stripes; thorax narrower; clypeal border broadly emarginate in the middle; hind metatarsi but little shorter than the hind tibiæ..*junodi* Forel.
4. Length 13 to 15 mm.; dark brown or castaneous..5.
   Length only 8 mm.; paler and more reddish brown......*osborni*, new species.
5. Body covered with short hairs; clypeus merely coarsely punctate..*sicheli* Mayr.
   Body almost hairless; clypeus transversely rugulose in the middle.
   langi, new species.

WORKERS

1. Mandibles 3-toothed. Length 1.7 to 1.9 mm..*arnoldi* (Forel).
   Mandibles 4-toothed..2.
2. Base of epinotum longer than the declivity, marginate on the sides. Length 1.6 to 2 mm..*vidua* F. Smith.
   Base of epinotum shorter..3.
3. Petiolar node one-fourth narrower than the postpetiole. Length 1.5 to 1.8 mm.
   silvestrii Santschi.
   Petiolar node as broad as the postpetiole..4.
4. Thorax not impressed at the mesoëpinotal suture; promesonotum but slightly longer than broad; epinotum subcuboidal with subequal base and declivity. Length 0.8 to 1 mm..*osborni*, new species.
   Thorax distinctly impressed at the mesoëpinotal suture; promesonotum much longer than broad; epinotum not subcuboidal, its base very short, its declivity long and sloping. Length 1.7 to 1.9 mm.........*junodi* Forel.

Carebara langi, new species

FEMALE.—

Length 13 mm.; wings 14 mm.

Head broader than long, narrower in front, with straight posterior border and rounded posterior corners. Eyes rather large, on the sides, twice as long as the straight cheeks; ocelli large, in deep impressions. Mandibles with 6 graduated teeth, the apical tooth large. Clypeus rather evenly convex, slightly depressed in the middle behind; its anterior border entire and broadly rounded. Frontal area large, semicircular, convex; frontal groove deeply impressed; frontal carinæ slightly lobed, diverging behind. Antennæ short, 10-jointed; scapes reaching only to the posterior orbits; funicular joints 2 to 4 a little broader than long, fifth joint as long as broad, remaining joints longer than broad, the three terminal joints forming an indistinct clava as long as the remainder of the funiculus. Thorax long and narrow, elliptical from above; mesonotum distinctly longer than broad, distinctly overarching the pronotum in front, with sharply marked parapsidal furrows. Epinotum in profile rectangular, with the declivity longer than the base, abruptly sloping, somewhat concave in the middle, on each side with a marginate projection which forms the bluntly rectangular outline of the epinotum in profile. Petiole from above a little longer than broad, in profile with straight ventral outline and rather low, rounded node, the anterior slope of which is feebly concave. Postpetiole twice as broad as the petiole, nearly twice as broad as long, very slightly flattened above and on the sides, with a distinct transverse impression anteriorly on the ventral surface. Gaster broadly and regularly elliptical, slightly flattened above and below. Legs rather short, hind metatarsi about three-fifths as long as the hind tibiæ.

Shining; sides of epinotum, petiole and postpetiole more opaque; mandibles very coarsely rugose-punctate; remainder of body with umbilicate punctures, which are smaller and sparser on the thorax and gaster than on the clypeus and head. Between these punctures there are more numerous, very minute but sharp punctures. Clypeus transversely rugulose, especially behind; front of head very finely longitudinally striate. Base and declivity of epinotum very finely transversely striate. Antennal scapes and legs finely punctate.

Almost hairless; only a few short, yellowish hairs towards the tips of the antennæ, on the mandibles, mouth-parts, border of clypeus and a patch of more numerous hairs at the tip of the gaster.

Deep castaneous; gaster, scutellum, pedicel and sides of epinotum blackish. Wings uniformly infuscate, with dark brown veins and pterostigma, the veins narrowly bordered with blackish.

A single specimen taken at light at Stanleyville (Lang and Chapin).

The species is evidently very different from all the described African species, except *sicheli* Mayr, but this form, judging from Mayr's description, is less shining, of a paler color, with small but distinct hairs arising from the coarse punctures on the body, the clypeus has a shallow longitudinal impression and is merely punctate and the sides of the epinotum are finely longitudinally striate. The study of more material of both forms may show that *langi* is to be regarded as a subspecies of *sicheli*.

Carebara osborni, new species

Plate XV; Text Figure 41

Worker.—

Length 0.8 to 1 mm.

Head subrectangular, slightly longer than broad, as broad in front as behind, with nearly straight posterior and very feebly and evenly rounded lateral borders. Eyes absent. Mandibles convex, with oblique 4-toothed apical borders. Antennæ 9-jointed, the scapes reaching to the middle of the sides of the head; funicular joints 2 to 6 very small, slightly broader than long (too long in the figure), terminal joint longer than the remainder of the funiculus (too short in the figure). Thorax narrower than the head; pro- and mesonotum flattened above, suboctagonal, a little longer than broad; epinotum subcuboidal, of the same height as the promesonotum but narrower, as long as broad, the base and declivity subequal in profile, meeting at a right angle, the base not marginate on the sides, the declivity in the middle sloping and longer than the base. Mesoëpinotal suture very distinct but not impressed. Petiolar node as long as broad, subglobular, peduncle short; postpetiole not broader than the petiole, with much smaller node. Gaster and legs of the usual shape.

Shining; mandibles finely and sparsely punctate; head and thorax above coarsely punctate, the latter more sparsely; punctures on the remainder of the body finer and sparser.

Hairs pale yellow, short, subappressed, not very abundant, most distinct on the gaster.

Pale brownish yellow, mandibular teeth and anterior border of clypeus darker brown.

Female (deälated).—

Length 8 mm.

Head, including the mandibles, as long as broad, broader behind than in front, with feebly convex posterior border, rounded posterior corners and straight cheeks. Eyes not very convex, on the sides of the head. Ocelli large, in deep impressions. Mandibles large, with oblique, 4-toothed apical borders. Clypeus with a broad longitudinal median impression, its anterior border broadly and sinuately emarginate in the middle. Frontal area absent, represented only by the impressed anterior end of the rather deep frontal groove. Frontal carinæ slightly flattened, scarcely diverging behind. Antennæ short, 10-jointed, scapes reaching to the posterior orbits; funicular joints 2 to 5 broader than long; joint 6 as long as broad, joint 7 somewhat more than half as long as joint 8, the terminal joint equal to joints 7 and 8 together. Thorax robust, longer than broad, broader than the head; the mesonotum convex, longer than broad, in front scarcely overarching the vertical pronotum, parapsidal furrows very distinct. Epinotum longitudinally grooved in the middle, with short base and a much longer, abrupt, rather flat declivity, bordered on each side by a large, flat, rounded and marginate lobe or crest. Petiolar node from above broadly oval, nearly as long as broad, evenly convex and rounded above, its anterior slope with a median blunt convexity, its ventral border in profile slightly concave in the middle. Postpetiole from above a little broader than the petiole, about one and two-thirds times as broad as long, convex above in front. Gaster broadly elliptical, somewhat flattened dorsally and ventrally. Legs rather short.

Shining; mandibles, head, epinotum, and sides and ventral portions of petiole and postpetiole more opaque. Mandibles very coarsely striatopunctate. Clypeus

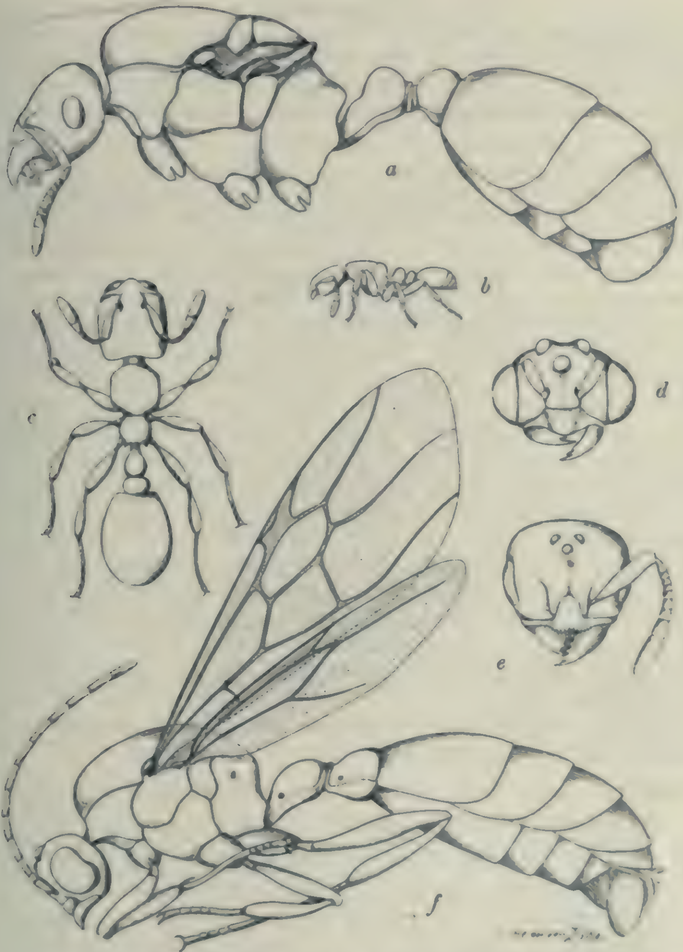


Fig. 41. *Carebara osborni*, new species. *a*, dealated female; *b*, worker in profile. *c*, same more enlarged; *d*, head of male; *e*, head of female, *f*, male in profile.

irregularly and indistinctly rugulose, somewhat transversely in the middle. Head coarsely and umbilicately punctate, finely striate in the spaces between the punctures. Mesonotum, scutellum, mesopleuræ, gaster, and nodes of petiole and postpetiole covered with umbilicate punctures of the same size as those on the head but sparser and with the shining interspaces very minutely and sparsely punctate. Opaque portions of epinotum and pedicel very finely striate. Legs with larger and minute punctures like the gaster, but the larger punctures are smaller and denser. Antennal scapes finely and densely punctate.

Hairs yellow, short, bristly, suberect, rather uniformly distributed over the body, arising from the large umbilicate punctures, longer on the gula and tip of the gaster, more abundant on the latter; very short, delicate and appressed on the legs and scapes.

Reddish brown; gaster and legs somewhat paler; mesonotum with indistinct traces of castaneous stripes, especially posteriorly. Mandibular teeth blackish.

MALE.—

Length 7 to 7.5 mm.

Head through the eyes much broader than long, broadest at the median transverse diameter, short and rounded behind. Eyes very large; ocelli large and prominent. Mandibles narrow, 3-toothed. Clypeus very convex and rounded in the middle with projecting, entire anterior border. Antennæ 13-jointed, long, filiform, of uniform thickness; scapes about three times as long as the first funicular joint, which is as broad as long but not swollen; remaining joints cylindrical, fully three times as long as broad, the terminal joint longer. Thorax robust, nearly as broad as long, through the wing insertions slightly broader than the head, convex above, in front somewhat overarching the pronotum. Epinotum short, shaped like that of the female, but without the marginate projections on the sides. Petiole resembling that of the female but with node scarcely developed; postpetiole much less convex, longer in proportion to its length. Gaster rather slender, scarcely flattened above; external genitalia voluminous, more or less exserted, the outer valves large, rounded at their tips. Legs slender.

Subopaque; scutellum, gaster, and upper surfaces of petiolar and postpetiolar nodes shining. Mandibles, head, thorax, and pedicel very finely and densely punctate; gaster also with fine but sparser punctures, those on the scutellum coarser but not so dense as on the remainder of the thorax.

Hairs finer, much shorter, and denser and more appressed on all parts of the body than in the female.

Brown; ocellar region black. Wings brownish, rather opaque, with the veins and pterostigma of the same color as the body.

Described from four workers, one female, and numerous males taken from a single colony at Niangara (Lang and Chapin) in the mound of a termite (*Termes natalensis* Haviland). According to Mr. Lang, the specimens were found "south of Niangara in one of the grass-covered termite hills which give the treeless landscape of the savannah its characteristic appearance (Plate XV). These hills extend as far as the eye can reach. They are never very high—rarely more than twelve feet—though they may attain a diameter of fifty feet at the base. Usually they appear as mere undulations of the ground, covered with grass which may be as much as ten feet high. The *Carebara* queen, males and workers were living in a flattened chamber about three feet above the general level of the soil near the center of a medium-sized termitarium."

C. osborni, though a true *Carebara*, is entirely unlike any of the known species in the small size of all the phases. In this respect and in the color of the male and female it approaches the species of the genus *Oligomyrmex*.

Carebara vidua F. Smith

Niangara, ♀; Faradje, ♀ (Lang and Chapin); Yakuluku, ♂ (J. Rodhain). The specimens from Niangara have the gaster black and therefore belong to the variety *dux* of Forel; one specimen from Faradje has the gaster castaneous and is therefore transitional to Santschi's variety *abdominalis*. Arnold has shown that these color differences are merely nest variations, so that they may be relegated to the synonymy of *vidua*.

PÆDALGUS Forel

The WORKER of this peculiar genus which is closely related to *Carebara* and *Oligomyrmex*, is monomorphic, minute, brownish yellow, with the eyes reduced to one or two ommatidia placed near the anterior third of the sides of the head. Ocelli absent. Maxillary and labial palpi each 2-jointed. Mandibles rather narrow, with oblique 4-toothed apical borders. Clypeus convex and projecting in the middle, extending back between the frontal carinæ, with a pair of longitudinal carinæ, which converge somewhat behind but do not terminate in teeth anteriorly. Antennæ rather stout, resembling those of *Carebara*, 9-jointed, with joints 2 to 6 of the funiculus small and transverse, the club large and distinct, 2-jointed. Thorax short and broad; the pronotum with rather angular humeri. Promesonotal suture lacking and, in the African species, with the mesoëpinotal suture scarcely indicated. Epinotum sloping, the declivity on each side with a low vesiculate lamina resembling in structure the epinotal laminæ of certain species of *Strumigenys*.

The FEMALE is considerably larger than the worker, with well-developed eyes and ocelli and 10-jointed antennæ, the club of the latter being 3-jointed and longer than the remainder of the funiculus. Mandibles 5-toothed. Clypeus convex, ecarinate. Thorax short, high, and arched, much broader than the head. Wings unknown.

The MALE has not been seen.

Forel founded this genus on *P. escherichi*, a species discovered by Escherich in a small cavity in a mound of *Termes obscuriceps* at Peradenyia, Ceylon. The minute workers were "running about on the back of their huge queen, like lice." Santschi in 1913 described as *Oligomyrmex infimus* from French Guinea the worker of a second species, which he later (1914) recognized as a *Pædalgus*. The following species is very similar.

Pædalgus termitolestes, new species

Plate XVI; Text Figures 42 and 43

WORKER.—

Length 1 mm.

Head subrectangular, a little longer than broad, nearly as broad in front as behind, with feebly rounded sides and feebly excavated posterior border. Eyes very small, situated at the anterior third of the head. Mandibles rather narrow, with four subequal teeth. Clypeus convex in the middle, bicarinate, with the anterior border projecting and truncated in the middle, narrow on the sides. Antennæ robust, scapes reaching to the second third of the sides of the head; funicular joints 2 to 6 subequal, much broader than long, together but little longer than the first joint; basal joint of club slightly longer than broad, less than one-third as long as the apical, which is nearly as long as the remainder of the funiculus. Thorax narrower and somewhat shorter than the head, broad in front, narrowed in the epinotal region, with subangular humeri; its dorsal surface in profile straight and horizontal to the base of the sloping, very bluntly angular epinotum, without promesonotal and mesoëpinotal sutures; the epinotal declivity on each side with a low, subtriangular, vesiculate lamina. Petiole with a short, stout peduncle, its node high, rounded, about one and one-half times as broad as long, transversely elliptical from above. Postpetiole smaller than the petiole, its node much lower, only a little broader, a little less than twice as broad as long. Gaster elliptical, its anterior border concave in the middle. Legs rather short.

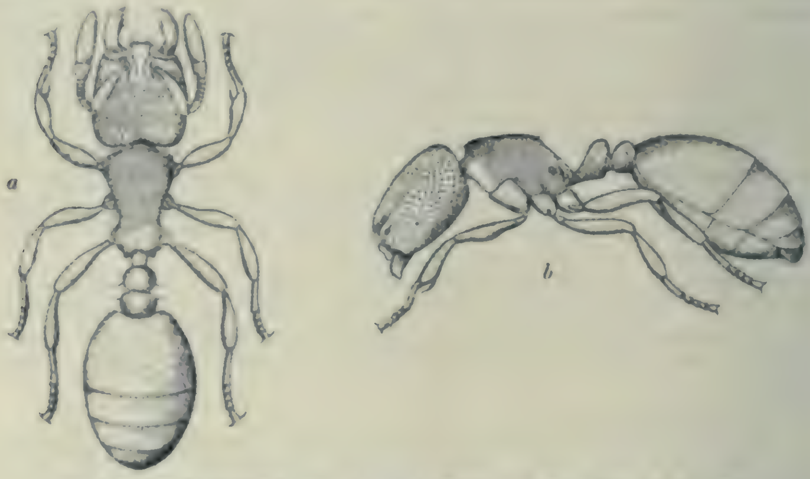


Fig. 42. *Pædalgus termitolestes*, new species. Worker. *a*, from above; *b*, in profile.

Head, thorax, petiole, and postpetiole opaque, covered with shallow, saucer-shaped punctures, arranged in regular rows on the head and each bearing in its center a short hair. Upper surfaces of petiolar and postpetiolar nodes smoother and somewhat shining. Gaster and legs very smooth and shining, with minute, sparse, piligerous punctures. Mandibles and antennæ subopaque, the former sparsely and coarsely punctate.

Hairs yellow, short, bristly, subereet, longer on the clypeus and gaster. There is a long bristle at each humeral angle, one on each side of the mesonotum near the base of the epinotum and one on each side of the petiolar and postpetiolar nodes.

Brownish yellow; legs and antennæ a little paler; mandibles and clypeus a little darker.

Described from numerous specimens taken from a single colony at Malela by Lang, Chapin, and Bequaert in a mound-shaped termitarium of *Acanthotermes militaris* (Hagen). The latter contained beautiful fungus-gardens, which are shown in Plate XVI. The cavities inhabited by the *Pædalgus* colony were in the walls of the fungus chambers at a spot corresponding to the upper right hand corner of the figure.

P. termitolestes is certainly very close to Santschi's *infimus* but differs in its somewhat larger size (*infimus* measures only 0.8 mm.) and in having the head longer than broad, with shorter and stouter scapes, a somewhat longer thorax, less transverse petiolar and postpetiolar nodes, and in having the promesonotum opaque.

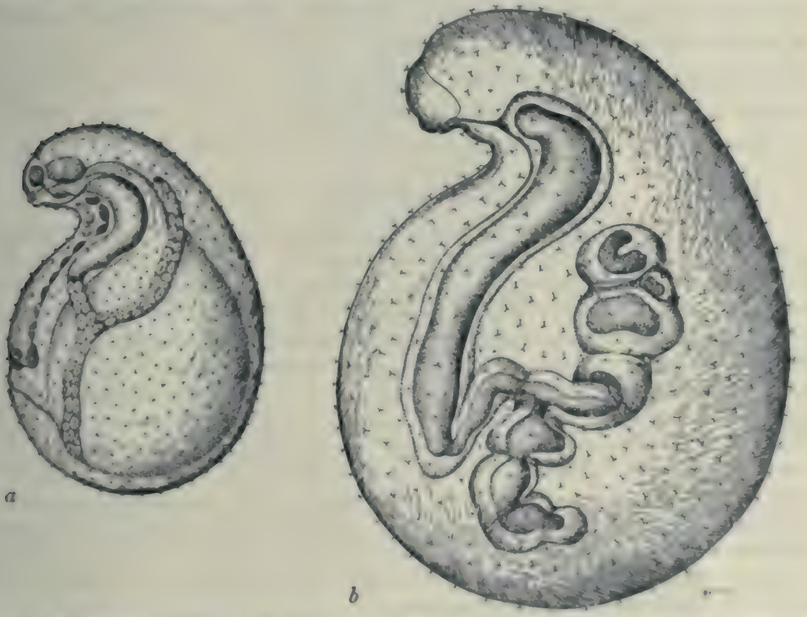


Fig. 43. *Pædalgus termitolestes*, new species. *a*, very young larva; *b*, nearly adult larva; lateral views to show the development of the salivary glands.

The specimens of the new species were accompanied by great numbers of worker larvæ and pupæ and nearly adult female larvæ. They are white, nearly spherical, with short neck, small head, and very feebly developed mouth-parts, indicating that they are fed by the tiny workers with regurgitated liquid food. They are not "glabres," as Santschi describes the larvæ of *P. infimus*, but covered uniformly with short, stiff, sparse hairs, each of which has two recurved branches (Fig. 43a and *b*). Even in alcohol, the larvæ cling compactly together in masses by means of these hooks. When stained and cleared, the larvæ are seen to possess unusually voluminous salivary glands. The youngest individuals, scarcely 0.2 mm. long, have the receptacle full of clear secretion (Fig. 43*a*). In older larvæ (Fig. 43*b*), the secretion after dehydration forms great masses in the receptacles and lumen of the glands. As these organs are not used in spinning a cocoon, it is very probable that the secretion, like the exudate of *Viticicola* and *Pachysima* larvæ described above, is elaborated and used as a food for the workers (trophallaxis).

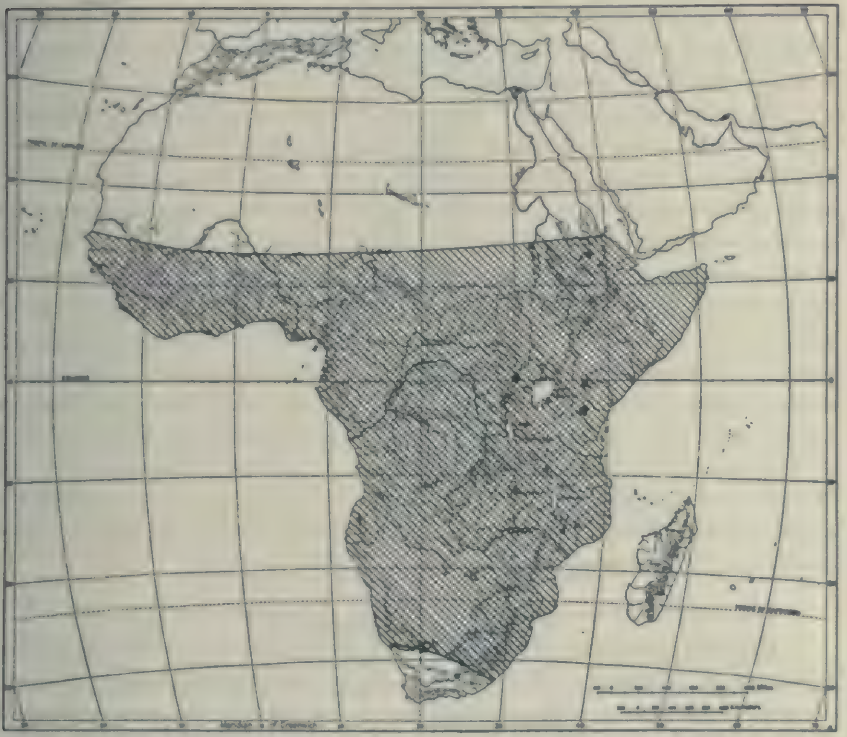
The observations of Lang, Chapin, and Bequaert show that the African species of *Pædalgus* have the same habits as the Ceylonese *P. escherichi* and as the species of *Carebara*. Since, however, the majority of African termites cultivate fungus-gardens, the interesting question as to whether the minute workers of *Pædalgus* feed on the termites, on the fungus mycelium, or on both can be answered only by future observations on artificial compound nests of the ants and their hosts.

ATOPOMYRMEX Ern. André

WORKER variable in size, but only feebly polymorphic, with 12-jointed antennæ and 3-jointed antennal club. Clypeus subtriangular; moderately and evenly convex, its anterior border feebly notched in the middle and on the sides. Frontal area and groove distinct. Frontal carinæ far apart, in the large workers continued back some distance as diverging ridges bordering scrobe-like impressions for the antennal scapes. Mandibles triangular, convex, with toothed apical margins. Eyes small, flat, nearly circular, placed near the middle of the sides of the head. Ocelli absent. Pronotum flattened above with rectangular humeri. Promesonotal suture indistinct. Mesonotum bituberculate; separated from the epinotum by a wide and deep constriction. Epinotum armed with two long diverging spines; its base bituberculate anteriorly. Petiole and postpetiole very small, the node of the former bispinose above; postpetiole transverse with distinct anterior angles. Legs long and stout, femora incrassated in the middle; middle and hind tibiæ without spurs. Gaster broadly elliptical, somewhat compressed dorsoventrally. Body without erect hairs; pubescence extremely short and sparse, appressed.

FEMALE considerably larger than the worker. Scrobe-like impressions of the head more distinct. Antennæ 12-jointed. Eyes small, but larger than in the worker; ocelli very small, close together. Thorax short, through the wing insertions slightly narrower than the head. Pronotum visible from above as the mesonotum is rather small and flat. Epinotum abrupt, without distinct base and without spines. Petiolar spines reduced to two blunt tubercles. Gaster large, elongate, convex above and below, nearly as long as the remainder of the body. Anterior wings with a discoidal, a single cubital and a closed radial cell, with a distinct intercubitus (*Solenopsis*-type).

MALE with short, stout, denticulate mandibles. Head broad and long, much broader than the thorax and with marginate occipital border. Clypeus carinate. Frontal carinæ strongly diverging. Eyes rather small, occupying only about one-fifth of the sides of the head. Antennæ 13-jointed; scapes very short, scarcely two and one-half times as long as broad; first funicular joint as broad as long, not swollen; remaining joints cylindrical. Epinotum and petiole unarmed. External genital valves long, triangular, pointed at the tip. Wings as in the female.



Map 25. Distribution of *Atopomyrmex mocquerysi* Ern. André.

This remarkable genus contains only a single species, which is widely distributed over the Ethiopian Region though not occurring elsewhere (Map 25).

Atopomyrmex mocquerysi Ern. André

Faradje, ☿, ♀; Lukolela to Basoko, ☿; Akenge, ☿; Medje, ☿ (Lang and Chapin); Matadi, ☿ (J. Bequaert).

This species is so variable that it is doubtful whether Forel's variety *curvispina* and Santschi's variety *australis* can be retained. The small workers among all the specimens before me have the epinotal spines more or less curved and directed backward, whereas in the large workers they are straight, more erect and more diverging. Besides the material from the localities cited above, I have specimens from the Congo, received from Ern. André, Delagoa Bay (P. Berthoud), Mwengwa, North West Rhodesia (H. Dollman), and Xalasi (C. W. Howard). There are also noticeable differences in the length and tenuity of the petiolar spines and in the strength of the cephalic and thoracic sculpture. The latter is noticeably strong in the specimens from Akenge, so that the head is scarcely shining in the occipital region.

The specimens taken by Lang and Chapin were nesting in cavities in dead wood. Those taken by Dr. Bequaert were "sucking nectar from the flowers of a tree (Anacardiaceæ) in the rocky savannah." Arnold says of the variety *curvispina* that "it is a slow ant, living in trees and mainly carnivorous in its diet. The nest is usually situated in a hollow stem, some distance above the ground. Like *Crematogaster*, these ants, when disturbed, exude a whitish and rather sticky secretion from the anal glands. It has not been found by me except in districts containing large trees." Bequaert found the nest of the typical *mocquerysi* "in a cavity in the wood at the base of a fig-tree (River Lovoi, near Kikondja, October 18, 1911)." He writes further: "I captured the male and female of this species in copula, flying in bright daylight (at noon) at the beginning of October (beginning of the rainy season)." The male and female of the species was first described by Forel from these specimens taken by Bequaert in the Katanga.

Atopomyrmex mocquerysi subspecies **cryptoceroides** (Emery)

Thirteen specimens from Malela (J. Bequaert) are referable to this form, which, I believe with Forel, is to be regarded merely as a subspecies of *mocquerysi* and not as an independent species. It is easily distinguished by its more shining head, coarser thoracic sculpture, and longer, stouter and, in the large workers, basally more flattened epinotal spines. The small workers have the spines slender, more curved, and more backwardly directed, just as in the small individuals of the true *mocquerysi*.

The habits of *cryptoceroides* are evidently the same as those of the typical form, as it had been previously taken by Bequaert at Elisabethville in the Katanga "nesting in the rotten wood of a felled tree."

Atopomyrmex mocquerysi subspecies **cryptoceroides** variety **melanoticus**, new variety

Text Figure 44

WORKER.—Length 4.2 to 8 mm. Differing from the typical form of the subspecies in color. The small workers are entirely black instead of brown; the large ones black, with the head blood red, darkened on the vertex, the antennal scapes black, the funiculi dark brown, especially towards their tips, and the thorax in some apparently less mature individuals, deep castaneous. The medium and large workers have the flattened bases of the epinotal spines distinctly and often sharply angulate externally.

Numerous specimens collected between Lukolela and Basoko "on fire-wood" by Lang and Chapin.

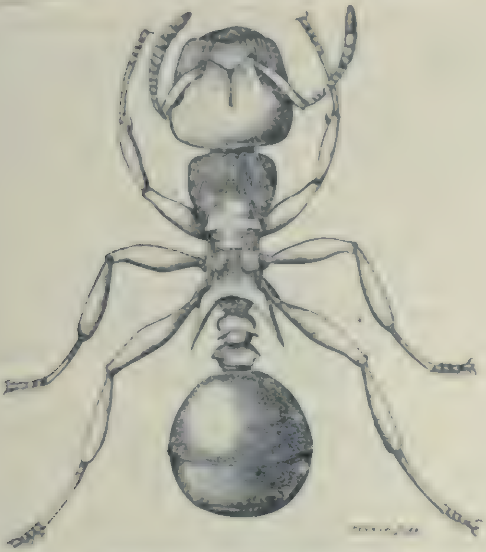


Fig. 44. *Atopomyrmex mocquerysi* **subspecies** *cryptoceroides* **variety** *melanoticus*, **new variety. Worker from above.**

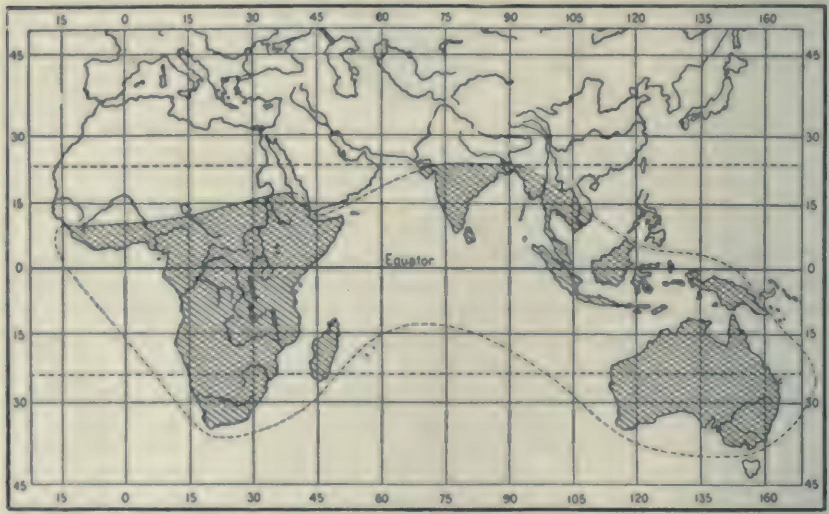
MERANOPLUS F. Smith

WORKER.—Body short and stout, somewhat flattened. Head broader behind than in front, convex above with frontal carinæ far apart, diverging behind and prolonged backwards as the upper margins of deep scrobes above the eyes for the accommodation of the whole folded antennæ. Eyes prominent, placed near the posterior corners of the head; ocelli absent. Clypeus short and steep. Mandibles small and stout, with a few subequal teeth. Antennæ 9-jointed, with a large 3-jointed club; the scapes thickened distally. Thorax short and broad, flattened above, the pro- and mesonotum marginate or lamellately expanded on the sides and behind, forming a disc with spined or toothed anterior corners and with the posterior margin lobed or toothed and overhanging the epinotum, which is very steep or vertical and usually armed with spines. Petiole squamiform, cuneate in profile. Postpetiole with a cuboidal, globose or squamiform node. Gaster large, oval or cordate, emarginate anteriorly at the articulation of the postpetiole. Body usually more or less opaque or subopaque and sculptured, covered with long, abundant and soft or flexuous hairs.

FEMALE decidedly larger than the worker, with 9-jointed antennæ. Thorax stout;. pronotum large and exposed above; mesonotum large and convex, rounded on the sides; epinotum unarmed. Fore wings with large pterostigma, a cubital, a discoidal and a closed radial cell.

MALE only slightly larger than the worker, rather slender, with 13-jointed antennæ; the scape very short; the first funicular joint globose, the second not much longer than the scape. Head produced behind, with very prominent eyes and ocelli. Antennal scrobes absent. Mesonotum with Mayrian furrows, rounded and unarmed on the sides or behind. Epinotum abrupt, unarmed. Nodes of petiole low. Legs slender Wings as in the female.

This genus is confined to the Old World tropics and ranges over the Ethiopian, Malagasy, Indomalayan, and Australian Regions (Map 26), being represented by the greatest number of species in Australia. The species form moderately populous colonies which nest in the ground, either under stones or in small crater nests. Many of the Australian species which I have observed in the field are true harvesters, storing their nests with seeds. The same habit has been recorded for an Indian species, *M. bicolor* (Guérin). Arnold, however, says that the species he has observed in Rhodesia "appear to be mainly carnivorous in their diet, but are also fond of sugary substance and attend aphids and coccids on plants." The workers move very slowly and readily curl up and "feign death" when handled.



Map 26. Distribution of the genus *Meranoplus*.

Meranoplus nanus Ern. André subspecies **soriculus**, new subspecies

Text Figure 45

WORKER.—

Length 1.8 to 2 mm.

Head subtrapezoidal, as broad as long, rather convex and rounded above, truncated behind. Mandibles with oblique, 4-toothed apical borders. Clypeus rather flat, with a short median carina posteriorly. Frontal area transverse, crescentic. Scrobes deep, extending to the posterior corners of the head. Eyes rather large, convex. Antennæ robust; club distinctly longer than the remainder of the funiculus. Pro- and mesonotum transversely rectangular, slightly broader than the head without the eyes, about one and one-half times as broad as long (somewhat too long in the figure), with sharply dentate anterior corners, the sides distinctly emarginate at the mesoëpinotal suture, which is straight and very distinct. Mesonotum rounded on the sides and narrowed to the posterior border, which bears four short, blunt, flattened teeth, the median pair being smaller and more approximated. Epinotum vertical, unarmed, somewhat concave in the middle, with a longitudinal welt on each side representing the spines. Petiole cuneate in profile, the node much compressed anteroposteriorly, much higher than the length of the segment, narrowed and bluntly pointed above, higher than the postpetiolar node, which has a similar shape but is less compressed above and with broader, transverse border. Gaster large, convex above, pointed posteriorly, its anterior border excised in the middle. Legs rather stout.

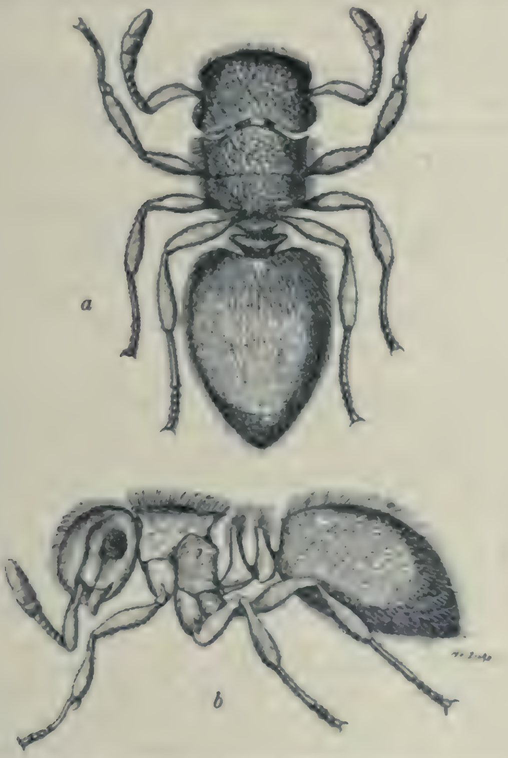


Fig. 45. *Meranoplus nanus* subspecies *soriculus*, new subspecies. Worker. *a*, from above; *b*, in profile.

Shining; mandibles opaque, finely and indistinctly striatopunctate. Clypeus and upper surface of head longitudinally but not strongly rugulose, with indistinctly punctate-reticulate interrugal spaces. Cheeks longitudinally rugose. Truncated posterior surface of head rather regularly reticulate rugose. Pro- and mesonotum with similar sculpture but the rugæ are feebler, so that the surface is more shining;

sides of thorax and epinotum nearly smooth, as are also the petiole and postpetiole. First gastric segment evenly covered with shallow punctures interspersed with extremely minute punctures.

Hairs white, delicate, soft, and abundant, forming a uniform erect fleece on the upper surface of the body, more oblique on the appendages, on the legs interspersed with a few exceptionally long hairs.

Brown; upper surface of head and first gastric segment, except at the base, dark brown; mandibles, except the teeth, legs, and antennæ brownish yellow.

Female.—

Length 4.5 to 4.8 mm.

Head like that of the worker. Thorax broader than the head, about one and three-fourths times as long as broad; broadest through the pronotum, the sides of which are somewhat swollen, but have blunt, though distinct, teeth. Mesonotum somewhat broader than long. Petiole and postpetiole much as in the worker, but the postpetiolar node is thicker above in profile.

Sculpture like that of the worker, but the mandibles coarsely striate and the sides of the thorax coarsely and irregularly reticulate rugose.

Hairs yellow, coarser, and shorter, especially on the gaster, than in the worker.

Color like that of the worker, but the mesonotum with three large, poorly defined, dark brown patches. Wings yellowish hyaline, with pale yellow veins and pterostigma.

Male.—

Length 2.5 mm.

Head, including the eyes, as broad as long, very convex behind. Eyes and ocelli large and convex; cheeks very short. Clypeus convex in the middle. Antennal scapes scarcely more than twice as long as broad; first funicular joint globose, second somewhat longer than the scape but distinctly more slender than the third joint. Thorax short, broader than the head including the eyes. Mesonotum convex, with distinct Mayrian furrows. Epinotum like that of the worker, but more sloping. Petiole longer than high or broad, the node low, angular in profile, with subequal anterior and posterior slopes, the former straight, the latter slightly concave. Postpetiole as long as high, somewhat depressed above, transverse, broader than the petiole.

Clypeus smooth and shining in the middle. Head subopaque, reticulate-rugulose. Pronotum and epinotum indistinctly punctate-rugulose, subopaque; mesopleuræ smooth and shining; mesonotum and scutellum less smooth but shining, indistinctly punctate. Petiole longitudinally rugulose-punctate; postpetiole smoother. Gaster as in the worker but the large punctures are less distinct.

Pilosity much as in the female, but the hairs on the body are even less even and on the legs are shorter and more appressed.

Colored like the worker, but the antennæ and legs are yellow. The veins and pterostigma of the wings are distinctly paler than in the female.

Described from numerous workers, five females, and six males taken at Avakubi (type locality) and a number of workers from Medje (Lang and Chapin). According to Mr. Lang, these ants "build small crater nests in the plantations. One crater was one and one-half inches high and four inches in diameter. The whole nest, three inches wide, extended beneath the surface to a depth of only six inches. The workers move very slowly. The native name is 'tungangele.' Eight workers from Medje were taken from the stomach of a toad (*Bufo funereus*).

I have described this form at length because it belongs to *nanus* Ern. André and is very closely related to Forel's subspecies *nanior* and its variety *kiboshanus* and to *inermis* Emery. The last I regard as a subspecies of André's species. All of these are known only from the worker. *M. nanus* measures 2.75 to 3.25 mm. and has two small, acute, spiniform teeth on the epinotum. The subspecies *nanior*, though of the same size as *soriculus* (1.9 mm.), is described as having the promesonotum one and three-fourths times as broad as long, the variety *kiboshanus* as being as large as the typical *nanus*, and *inermis* has the posterolateral corners of the mesonotum rectangular and, judging from Emery's figure, lacks the mesoëpinotal suture. The various forms mentioned are from widely separated localities, *nanus* from Gaboon, *inermis* from Transvaal and Eritrea, *nanior* and *kiboshanus* from East Africa.

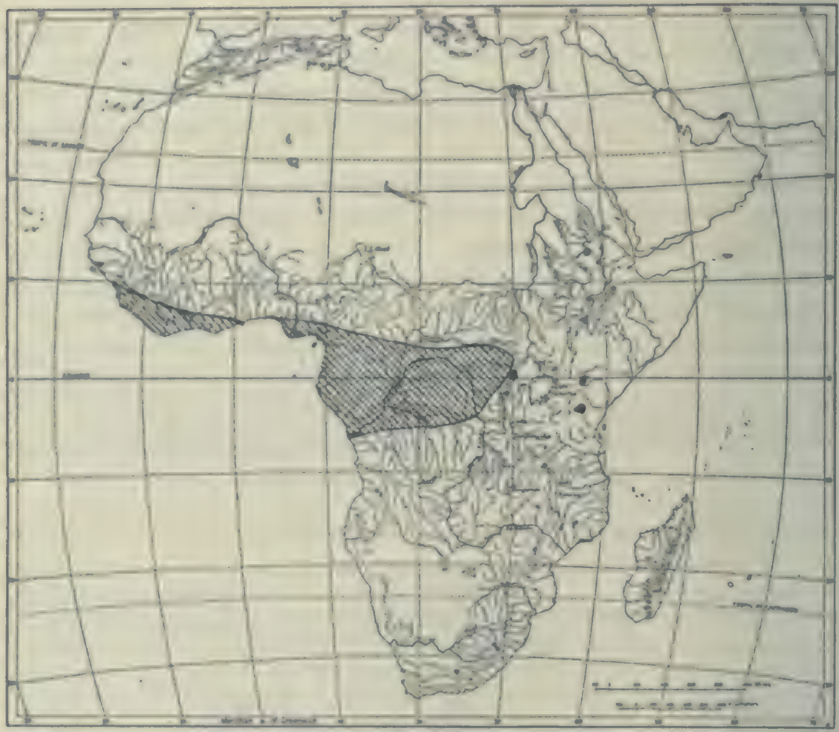
MACROMISCHOIDES Wm. M. Wheeler

WORKER small, monomorphic. Head subrectangular, with rounded posterior corners, rather convex lateral borders, and convex, moderately large eyes at the middle of the sides. Ocelli absent. Mandibles triangular, their apical margins with numerous unequal teeth. Maxillary palpi 3-jointed; labial palpi 2-jointed. Clypeus convex; its anterior border entire or feebly notched in the middle; its posterior portion extending back between the frontal carinæ; its sides not greatly narrowed and without a trenchant ridge in front of the antennal fovea. Frontal carinæ short, rather far apart, diverging behind, not prolonged as borders of scrobe-like depressions. Antennæ long and slender, 12-jointed, with a 3-jointed club, which is shorter than the remainder of the funiculus, terminal joint somewhat enlarged, as long as the two preceding joints together. Thorax rather long and slender, distinctly constricted in the mesoëpinotal region, with very long straight epinotal spines, but without metasternal spines. Pronotum on each side above with a bluntly angular elevation, the inferior border broadly rounded. Peduncle of petiole long and slender, the node compressed anteroposteriorly, very slightly squamiform. Postpetiole small, scarcely broader than the petiole, constricted behind. Gaster ovate, rather small. Legs long and slender; middle and hind tibiæ without spurs.

FEMALE similar to the worker, but larger. Thorax not broader than the head including the eyes; pronotum not covered by the anterior portion of the mesonotum, which is short and convex. Epinotum sloping, with stout spines. Abdomen shaped much as in the worker. Fore wings with a single cubital, a discoidal and a closed radial cell.

MALE nearly as large as the female. Head small, with prominent eyes and ocelli. Mandibles well developed, with several teeth. Antennæ 11-jointed, the second funicular joint representing three fused joints. Mesonotum without distinct Mayrian furrows. Petiolar node very low. Cerci distinct; hypopygium with a bluntly rounded point; external genital valves short and stout, obtusely pointed. Legs very slender. Wings as in the female.

GENOTYPE.—*Macromischa aculeata* Mayr.



Map 27. Distribution of the genus *Macromischoides*.

I include in this genus also Mayr's *M. africana*, which is hardly more than a subspecies of *aculeata*. Emery placed both of these forms in *Tetramorium*. Their habitus is certainly that of certain forms of *Macromischa*, as Mayr observed, but Emery was right in excluding them from that Neotropical genus. Both species are confined to the rain forests of West Africa (Map 27) and do not nest in the ground like the species of *Tetramorium* but build loose carton nests between leaves or on their under surfaces. Mayr claimed that the male *aculeata* has 11-jointed antennæ, but Emery, after examination of six specimens, maintained that these appendages are 10-jointed and that Mayr's specimens must have been abnormal. There are four males in the Congo collection from two different localities and all of them have 11-jointed antennæ. Emery probably overlooked the third funicular joint, which is rather rigidly articulated with the second joint so that the suture can be distinctly seen only in a favorable light. The number of joints in the male antennæ, the shape of the clypeus in the worker and female, the absence of spurs on the middle and hind tibiæ, the long slender legs and antennæ, the absence of the Mayrian furrows in the male, and the reduced number of palpal joints are all characters which seem to me to justify a new generic name. The peculiar habits, too, are important in this connection, although alone they would hardly justify a change in Emery's allocation of the species, since in a well-marked genus like *Myrmicaria* we have seen that some of the smaller species build carton nests on leaves whereas the larger species nest in the ground. The genus *Tetramorium* certainly becomes more homogeneous by the removal of the two Mayrian species.

Macromischoides aculeatus (Mayr)

Plate XVII, Figure 1

Stanleyville, ☿; Avakubi, ☿, ♀; Bafuka, ☿; Medje, ☿, ♀, ♂; Isangi, ♀; Leopoldville, ☿ (Lang and Chapin); Bumba, ♂ (J. Bequaert) Many workers and females and four males.

The following note by Mr. Lang accompanies the specimens from Medje: "These ants build their nests by filling out interstices between neighboring leaves with a rough-looking, light mass of decomposed vegetable matter. They prefer densely leaved trees and there are sometimes several hundred nests on the same plant. If one touches the tree, the ants at once rush out of their nests in great numbers and hurry along the branches to reach the intruder. They cling to the human skin and double themselves up while biting and stinging. The result is rather painful and very annoying. There is no swelling but the pain endures for several minutes. All of the ants climb towards the head. The nests are often empty and contain only a few workers, but sometimes they are filled with brood and winged individuals. These ants have a strong odor, especially when rubbed between the fingers." In the plate (Pl. XVII, fig. 1) two of the nests are shown, one *in situ*, the other with one of the two thick leaves between which it was built removed.

M. aculeatus is so common in the Congo that its nests have been seen by several previous observers. Santschi[1] says of these structures: "Their nest consists of the leaf of a tree or shrub rolled up and lined with a felt-work of very fine vegetable débris and of a mycelium bearing fructifications. It would be interesting to study this fungus where it grows and to ascertain whether or not it is used habitually by the ants as food and is cultivated for this purpose." Commenting on the variety *rubroflava*, Forel[2] remarks that it was "found in nests woven of silk, fixed to leaves, and, according to Mr. Kohl, similar to those of *Œcophylla* and *Polyrhachis*. From this fact I conclude that the nest of *T. aculeatum* is probably only superposed on a woven tissue, i.e., it is a combination of carton and tissue, as I have proved to be the case in many species of *Polyrhachis*."

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[1] 1909, Ann. Soc. Ent. France, LXXVIII, p. 385.
[2] 1916, Rev. Suisse Zool., XXIV, p. 421.

Examination of a nest of *aculeatus* preserved in alcohol by Mr. Lang and conversation with Dr. Bequaert, who is well acquainted with the habits of the ant in the Congo, have convinced me that both Santschi and Forel labor under a misapprehension in regard to the structure of the nest. It consists of particles of the most diverse vegetable substances, bits of bark, dead leaves, trichomes, etc., loosely felted together and invaded by fungus mycelium, but the latter bears nothing resembling fructifications or ambrosial bodies such as are found in the gardens of fungus-eating ants. Dr. Bequaert informs me that *aculeatus* often nests in forests that are inundated during the rainy season and, as fungus hyphæ in such situations in the tropics grow readily on any dead vegetable matter, it is not surprising that we should find them invading the loose carton of the *aculeatus* nests. These hyphæ were interpreted as silk by Forel and suggested to Santschi the possibility of the ant being mycetophagous.

Macromischoides aculeatus variety **wasmanni** Forel

Numerous workers from Zambi (Lang and Chapin); one female from Stanleyville. This variety is smaller than the typical *aculeatus*, with somewhat shorter epinotal spines, less regularly sculptured and somewhat paler.

TETRAMORIUM Mayr

WORKER small, monomorphic. Antennæ 12-jointed, with a 3-jointed club. Clypeus narrowed on the sides where its posterior margin is raised in the form of a short trenchant ridge or carina as the anterior border of the antennal socket. Frontal carinæ rather far apart, usually continued back some distance and often the full length of the head as subparallel ridges forming the inner borders of scrobes or demiscrobes for the accommodation of the antennal scapes. Maxillary palpi 4-jointed; labial palpi 3-jointed. Eyes well developed; ocelli absent. Mandibles rather large, triangular, their apical border with a few large and several small teeth. Promesonotal suture indistinct, mesoëpinotal suture more or less distinct; mesoëpinotal constriction usually feeble; epinotum with two spines or teeth and episterna usually spined or dentate. Petiole with a short but distinct peduncle and the node large, subcuboidal, rounded above, rarely squamiform; the postpetiole usually broader than the petiole. Legs rather short, middle and hind tibiæ with small, simple spurs. Head, thorax, and petiole sculptured, usually rugose or reticulate rugose.

FEMALE resembling the worker, but somewhat larger. Pronotum usually very little exposed above; mesonotum and scutellum raised above the level of the pro- and epinotum, the latter with stouter and shorter spines than in the worker. Fore wing with one cubital, one discoidal, and a closed radial cell.

MALE slightly smaller than the female, with 10-jointed, very exceptionally with 12- or 13-jointed antennæ. Second funicular joint very long, representing a fusion of 4 joints. Head small, ocelli and eyes large. Mandibles small but dentate. Pronotum overarched by the mesonotum, which has distinct Mayrian furrows. Epinotum truncate and dentate. Wings as in the female.

This genus might be described as peculiar to the Old World, because nearly all the few species occuring in America (*T. cæspitum*, *simillimum*, and *guineense*) are known to have been introduced by commerce. The group reaches its greatest development in the Ethiopian Region so far as the number of species, subspecies, and varieties is concerned. Arnold has included *Triglyphothrix*, *Xiphomyrmex*, and *Decamorium* as subgenera, but I have treated them as genera, though a few species with simple hairs may be assigned indifferently either to *Tetramorium* or *Triglyphothrix*. I have still further reduced the size of the genus *Tetramorium* by establishing a new genus, *Macromischoides*, for *T. africanum* and *aculeatum* (*vide supra*). The species of *Tetramorium* form moderately large colonies and nest in the ground, usually under stones or logs. One of the species, *T. cæspitum*, has a remarkable distribution, ranging from Britain to Japan, around the shores of the Mediterranean, and reappearing at higher elevations on Mt. Kilimanjaro.

Tetramorium sericeiventre Emery

Two workers from Thysville (J. Bequaert) and two others from Garamba, taken from the stomach of a toad (*Bufo regularis*) by Lang and Chapin, are referable to this species, which is distributed over the whole African continent.

Tetramorium sericeiventre Emery subspecies **continentis** (Forel)

Plate XVII, Figure 2

Numerous workers from Zambi (Lang, Chapin, and Bequaert), found making small nests in sand (Pl. XVII, fig. 2). According to Mr. Lang's notes, "the craters were often very regular, perfectly circular and composed of the excavated particles of white sand. The colony photographed shows three entrances close together. The nest extended about 50 cm. below the surface to just above a moist layer of sand. The territory in which the ants nest is evidently inundated during the rainy season (at high water), but now (during the dry season) the water is about four feet below the surface. One colony was seen covering small areas about as large as the hand; the nest entrance was oblique, running under an overlapping thin layer of sand. The ants were working at noon in fairly bright sunshine. When disturbed, they all disappeared inside the nest. The craters consisted entirely of fine white sand-grains, without admixture of food particles."

Tetramorium guineense (Fabricius)

Two workers from Ngayu, taken by Lang and Chapin from the stomach of a toad (*Bufo superciliaris*).

Tetramorium guineense subspecies **medje**, new subspecies

WORKER.—Length nearly 4 mm. Decidedly larger than the typical *guineense* but of the same color, except that the head, thorax, petiole, and legs are concolorous and somewhat more brownish. Clypeal border distinctly emarginate in the middle; funicular joints 2 to 4 small, strongly transverse. There is a very distinct transverse crest to the pronotum like that described by Stitz for the subspecies *cristatum*. The epinotal spines are long, and stout, and curved forward as in the subspecies *peutli* Forel. The episternal spines are strongly curved upward and fully half as long as the epinotal spines. Petiolar node of the same shape in profile as in *cristatum*, with its anterior and posterior surfaces subequal, abrupt, distinctly concave and marginate above, but the node is much longer than in the typical *guineense*, broader behind than in front and with its dorsal surface roof-shaped as in *peutli*. Postpetiole robust, nearly as long as broad. Mandibles smooth and shining, with minute, scattered, indistinct punctures. Sculpture much coarser than in the typical *guineense;* clypeus with three prominent longitudinal carinæ or rugæ; the rugæ on the head and thorax longitudinal but connected by reticulations; the sculpture of both nodes equally coarse and as coarse as that of the thorax. Anterior fourth of first gastric segment sharply longitudinally striate. Pilosity yellow, decidedly longer and coarser than in the typical *guineense*.

Described from two specimens, one taken from the stomach of a toad (*Bufo regularis*), from Medje (Lang and Chapin). This form is so strongly marked that it might be called a species, but, as many of its characters are those of described subspecies of *guineense* and as I have seen only two specimens, I prefer to attach it provisionally to that species.

Tetramorium meressei Forel

A single worker taken by Dr. Bequaert at Masaki (between Masisi and Walikale) agrees very closely with Forel's description, except that the erect hairs on the body are coarser and not "wooly" and the gaster is not darker in the middle but uniformly yellowish brown like the remainder of the body. Dr. Bequaert took his specimen from one of the domatia of a *Cuviera* (probably *C. angolensis*), the other swellings of which were occupied by *Engramma denticulatum* Wheeler.

Tetramorium pusillum Emery variety **hemisi,** new variety

WORKER.—Length 2.5 to 2.8 mm. Agreeing closely with Emery's description of the typical *pusillum* in size, sculpture, and coloration, but with the basal third or fourth of the first gastric segment densely punctate and nearly opaque, and with the epinotal teeth acute. The latter are distinctly larger than the metasternal teeth.

Described from fourteen workers taken from the stomach of a frog (*Hemisus marmoratum*) from Niangara (Lang and Chapin). The Abyssinian subspecies *ghindanum* Forel is slightly larger than this variety (at least this is true of several cotypes sent me by Prof. K. Escherich many years ago) and the opaque basal portion of the gaster is more extensive and finely striolate-punctate.

Tetramorium setigerum Mayr subspecies **quærens** Forel

Plate XVIII, Figures 1 and 2

Numerous workers from Niapu (Lang and Chapin). The note accompanying the specimens states that they "form a ring of loose particles of soil about the entrance of their nests during the rainy season, each ant carrying the particle to a certain distance and then letting it drop and returning at once to the entrance. During the dry season they carry out the particles and food-remnants without attempting to construct a crater. The photographs (Pl. XVIII) show the difference in the appearance of the nest during the wet and dry seasons. These ants are very common, as about a dozen colonies were observed about the village of Niapu. They were usually situated along the paths or in clearings and seem to prefer dry soil."

Tetramorium simillimum (F. Smith)

A single worker from Stanleyville (Lang and Chapin). This is a common tropicopolitan ant, now widely distributed by commerce.

Tetramorium simillimum subspecies **isipingense** Forel variety **dumezi** Forel

A single worker taken by Dr. Bequaert at Thysville.

XIPHOMYRMEX Forel

This genus is very closely related to *Tetramorium*, differing only in having the antennæ of the worker and female 11- instead of 12-jointed. The scrobes of the antennæ are well developed in all the species known to me.

The genus is widely distributed, being represented by a number of species in tropical Africa, Madagascar, the Indomalayan and Australian Regions and by one species, *X. spinosus* (Pergande), with several subspecies, in the Sonoran Province of North America. The various species nest in the ground, like *Tetramorium*, often in very populous colonies.

Xiphomyrmex angulinodis Santschi

Medje, ☿, ♀, ♂; Irumu, ♀ (Lang and Chapin).

Santschi has described all three phases of this species from the French Congo and has figured the worker and male. The specimens before me agree perfectly with his account. They bear no data beyond the localities.

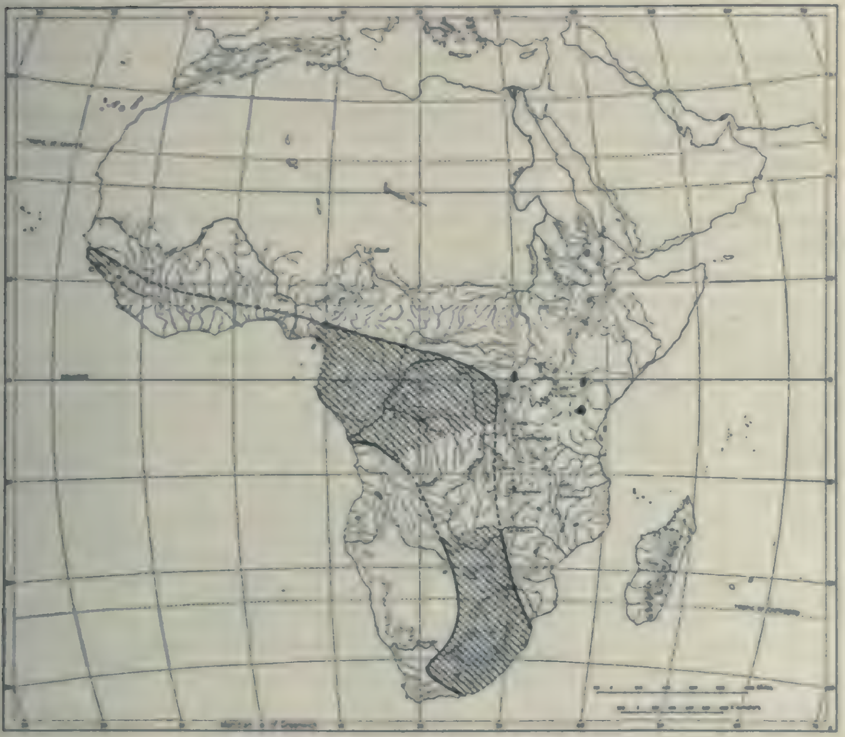
Xiphomyrmex occidentalis Santschi subspecies **akengensis**, new subspecies

WORKER.—Length 1.8 to 2 mm. Smaller than the typical form, which measures 3.5 mm., with the mandibles red, the tarsi, middle and hind coxæ and tips of fore coxæ brownish yellow, and the remainder of the legs and the antennæ reddish brown. The seventh funicular joint is as long as broad; the eyes smaller and more flattened than in the type, scarcely more than one-sixth as long as the side of the head, with the anterior orbits somewhat narrowed and bluntly pointed. The postpetiole is twice as broad as long, its node somewhat transverse and compressed anteroposteriorly, the petiolar node also somewhat broader and more squamiform than in the type. In other respects agreeing very closely with Santschi's figure and description.

Described from numerous specimens taken at Akenge (Lang and Chapin) from a single colony in "a dark brown paper nest." There is nothing to show that these specimens were not inhabiting the abandoned nest of some other ant. A single deälated female from Liberia in my collection belongs, in all probability, to this subspecies. It measures nearly 2.5 mm. and is very much like the worker. The larger eyes are not bluntly pointed in front, though rather flat. The thorax is small, with small mesonotum, bluntly pointed in front and not covering the pronotum, the epinotal spines are much stouter and further apart than in the worker, the petiolar node is broader, more squamiform and more transverse above, more sharply separated from the peduncle, and with its anterior surface decidedly concave. The color is the same as that of the worker, the body being brownish black with the appendages paler.

RHOPTROMYRMEX Mayr

WORKER small, allied to *Tetramorium*. Antennæ 12-jointed, with 3-jointed club, as long as or slightly longer than the remainder of the funiculus. Maxillary palpi 3-jointed; labial palpi 2-jointed. Head broader behind than in front, with convex sides and small moderately convex eyes at the middle of its transverse diameter. Ocelli absent. Clypeus flattened or moderately convex, ecarinate, its anterior border entire, a little produced, narrowed on the sides and bluntly ridged in front of the small antennal foveæ. Frontal carinæ short and more or less diverging; frontal area large but not impressed. Scrobes absent. Thorax short and stout, convex and rounded above, with feeble or obsolete promesonotal suture, somewhat constricted or impressed at the mesoëpinotal suture, the epinotum unarmed. Petiole pedunculate, the node



Map 28. Distribution of the genus *Rhoptromyrmex*.

rounded, narrower than the postpetiole, which is transversely elliptical and rounded above. Gaster oval, formed very largely by the first segment. Legs moderately long, femora not incrassate in the middle, the middle and hind tibiæ with or without short simple spurs.

FEMALE somewhat larger than the worker, with 12-jointed antennæ, but differing considerably in structural details in the various species. Fore wings with a cubital, a discoidal and an open radial cell.

MALE with 10-jointed antennæ and elongate second funicular joint, as in *Tetramorium*, and closely resembling the males of this genus also in other respects. Wings as in the female.

The species of this genus are confined to the Ethiopian Region (Map 28). A few Indian forms formerly referred to the genus have been recently placed by Emery in a new genus, *Acidomyrmex*, characterized by having very long, straight and diverging epinotal spines.

Rhoptromyrmex opacus Forel

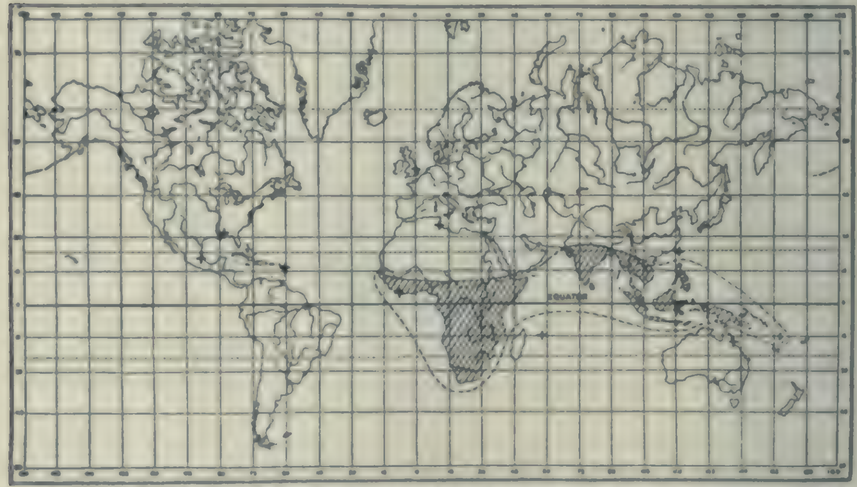
Numerous workers taken at Thysville by Bequaert. These were found nesting in sandy soil in the savannah.

TRIGLYPHOTHRIX Forel

Small ants closely allied to *Tetramorium*.

The WORKER has 12-jointed antennæ, the funiculus terminating in a 3-jointed club. Mandibles and clypeus as in *Tetramorium*. Head with distinct scrobes, often divided by a longitudinal carina for the reception of the folded scape and funiculus. Thorax short and stout, the promesonotal and mesoëpinotal sutures nearly or quite obsolete. Epinotum and episterna armed with spines much as in *Tetramorium*. Petiole pedunculate, its node and especially that of the postpetiole decidedly broader than long. Hairs on the body abundant, soft, erect, trifid or many-branched, covering the surface like a delicate white mould.

FEMALE similar to the worker but larger; anterior wings with one closed cubital cell and an open radial cell.



Map 29. Distribution of the genus *Triglyphothrix*. The crosses indicate the localities where *T. striatidens* (Emery) has been found outside of its range.

MALE with 10-jointed antennæ, the second funicular joint very long, the third shorter than the first. Mesonotum with Mayrian furrows. Petiolar and postpetiolar nodes narrower than in the worker and female, the petiole subpedunculate.

This genus is paleotropical, ranging over the Ethiopian, Indomalayan, and Papuan Regions (Map 29). One Indian species, *T. striatidens* (Emery), is rapidly spreading to other parts of the world and has been taken in such widely separated localities as Queensland, Formosa, Tunis, Sierra Leone, Seychelles, Barbados, Mexico, Louisiana, and England. In the locality last mentioned it occurs in the hothouses of Kew Gardens.

The species of *Triglyphothrix* are all very timid, usually curling up and feigning death when touched. They live in the ground. One South African species, *T. arnoldi* Forel,[1] according to Arnold, "is most frequently found in the nests of other ants, apparently in plesiobiotic or cleptobiotic association." He mentions its occurrence in the galleries of two large Ponerinæ, *Platythyrea lamellosa* subspecies *longinoda* variety *rhodesiana* Forel and *Ophthalmopone berthoudi* Forel.

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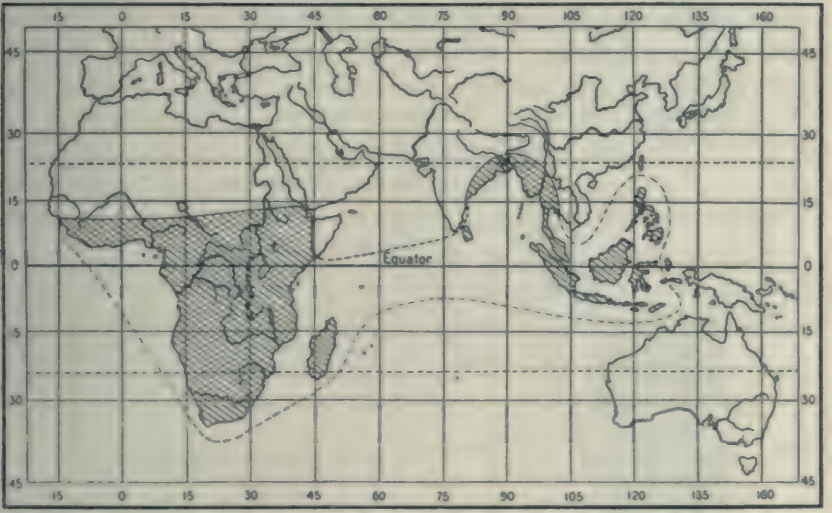
[1] According to Emery, this species is a typical *Tetramorium*, in which genus I have placed it in the catalogue of Ethiopian ants.

Triglyphothrix gabonensis Ern. André

Akenge, ☿, ♀; Niapu, ☿; Ngayu, ☿; Medje, ♀ (Lang and Chapin). Seventeen workers and two deälated females, all taken from the stomachs of toads (*Bufo funereus*, *tuberosus*, and *polycercus*).



Map 30. Distribution of the genus *Cataulacus*.

Triglyphothrix mucidus Forel

Medje, ☿; Ngayu, ☿; Boyulu, ☿ (Lang and Chapin). Four specimens from the stomachs of toads (*Bufo funereus*).

CATAULACUS F. Smith

WORKER.—Small or medium-sized, rather flat, opaque or subopaque, black ants, with coarse sculpture and the head and thorax often dentate or spinulate on the sides. Antennæ in all three phases 11-jointed with 3-jointed club and apically flattened or dilated scape. Head on each side with a deep scrobe situated beneath and external to the eye and capable of accommodating the whole of the folded antenna. The frontal carinæ are far apart and diverge, but border the scrobes only at the base. The clypeus is wedged in between the frontal carinæ and is not sharply delimited posteriorly. Thoracic sutures often indistinct or obsolete. Epinotum armed with spines. Petiole and postpetiole stout, the former usually more or less cuboidal, with a laminate process below, the latter subglobular. Gaster elliptical or suboblong, flattened, the first segment forming its whole dorsal surface. Legs rather short, the femora and tibiæ incrassated.

The FEMALE, though larger, closely resembles the worker. The pronotum is large and forms a considerable portion of the thoracic dorsum. Wings without a discoidal cell, with a single cubital and a narrowly open radial cell.

The MALE resembles the female and worker in the shape of the head but has larger and longer petiole and postpetiole. The mesonotum has well-developed Mayrian furrows.

The ants of the genus *Cataulacus* bear a strange superficial resemblance, both in structure and habits, to those of the Neotropical genus *Cryptocerus*. The genus ranges over tropical Africa and eastward over Madagascar, India, Indonesia, and the Philippines, but is represented by the greatest number of species in the Ethiopian Region (Map 30). Concerning the habits, Arnold says that "all the species of this genus are tree-ants, usually forming medium-sized nests in hollow twigs and stems, or more rarely under the bark. They are timid and slow-moving insects, often feigning death or dropping rapidly to the ground when disturbed." He has seen them breaking open the earthen tunnels constructed by termites on the trunks of trees and attacking the inmates.

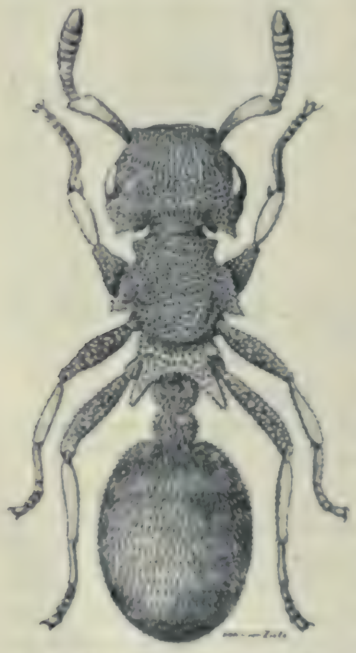


Fig. 46. *Cataulacus erinaceus* Stitz
Worker from above.

Cataulacus erinaceus Stitz

Text Figure 46

Stanleyville, ☿; Risimu, ☿ (Lang and Chapin). The collection contains many workers of this large and beautiful species, originally described and figured by Stitz from the Cameroon and Spanish Guinea. Forel many years ago gave me a specimen labelled "*Cataulacus princeps* Emery" and has himself referred to it under that name, which seems to exist only in manuscript. Lang and Chapin found this ant running up and down large trees.

Cataulacus guineensis F. Smith

Text Figure 47

Stanleyville, ☿; Bolobo, ☿; Leopoldville to Yumbi, ☿, ♀; Lukolela to Basoko, ☿; Isangi, ☿; Medje, ☿, ♀; Akenge, ♂ (Lang and Chapin). Numerous specimens, all apparently belonging to the typical form of the species. Many were taken on fire-wood. Nine workers from Medje and twelve males from Akenge were taken from the stomachs of toads (*Bufo polycercus*, *funereus*, and *tuberosus*).

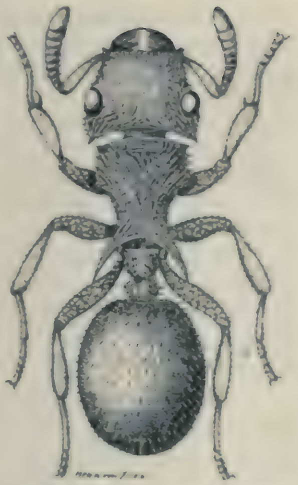


Fig. 47. *Cataulacus guineensis* F. Smith. Worker from above.

Cataulacus egenus Santschi

Medje, ☿, ♀ (Lang and Chapin). Numerous specimens. The hitherto undescribed female measures 4 to 4.5 mm., and is very similar to the worker except in the structure of the thorax. The mesonotum and sides of the pronotum are longitudinally rugulose. The wings are whitish hyaline, with the anterior border suffused with yellow, the veins pale yellow, the pterostigma dark brown.

Cataulacus pygmæus Ern. André subspecies **lujæ** (Forel)

Five workers from Garamba (Lang and Chapin) without further data.

Cataulacus trægaordhi Santschi variety **plectroniæ**, new variety

WORKER.—Length 2.8 to 3.2 mm. Smaller than the typical form of the species and the variety *ugandensis* Santschi. The rugæ of the head have no longitudinal trend, those on the pronotum are very coarse and somewhat transverse and those on the mesonotum and base of the epinotum fine and indistinctly longitudinal The portions of the antennæ and legs, which in the typical form are red or yellowish red, are whitish yellow or white, the scapes, and tibiæ being paler than the tips of the femora, the tarsi brownish yellow, the funiculi reddish brown.

Described from two dozen specimens taken at Stanleyville by Lang and Chapin from the cavities of a species of *Plectronia* (*Plectronia* A, see Part IV).

Dolichoderinæ

A very homogeneous subfamily, comprising comparatively few genera. WORKER monomorphic, very exceptionally (certain species of *Azteca*) more or less dimorphic. Clypeus protruding between the insertions of the antennæ. Antennæ 12-jointed (except in *Semonius*). The metanotum contributes to the dorsal face of the thorax, being wedged in between the epinotum and mesonotum, and its stigmata are often protuberant. Pedicel formed by the petiole alone, the postpetiole forming the basal segment of the gaster; the following segment without stridulating surface. Sting vestigial, except in *Aneuretus*, where it is well developed and can be protruded. Usually there is one pectinate spur on the middle and hind tibiæ, homologous with the median spur of the Ponerinæ; sometimes with a second, lateral spur which is much smaller and simple. FEMALE always winged; similar to the worker. Some genera still retain a more generalized wing venation with two closed cubital cells and one discoidal cell; but frequently the venation is more or less reduced, often considerably so in the MALE. Antennæ of the male 13-jointed, even in *Semonius*.

The Dolichoderinæ males with two closed cubital cells can usually be separated by the well-developed mandibles from such Ponerinæ as have no constriction behind the postpetiole. The clypeus protruding between the frontal carinæ is a good character by which to separate them from the male Formicinæ with a similar venation.

NYMPHS never enclosed in a cocoon.

The anatomy of the gizzard or proventriculus is very important for the taxonomy of this subfamily; for a description of this organ the student is referred to the writings of Forel[1] and Emery.[2]

The larvæ are fed with liquid food, almost always of vegetable origin, regurgitated by the workers; the *Aztecæ* are mostly insectivorous. All the workers possess anal glands, the secretion of which hardens on exposure to the air, becomes sticky, and has a peculiar, often unpleasant odor like that of rotten cocoanuts or rancid butter; it is used as a means of protection against other insects. The habits are rather varied; many species are inconspicuous, shy, and live in small colonies under bark of trees or in dead wood. In the Australian *Leptomyrmex* the worker can store vegetable liquids in its much inflated crop (honey ants). Several species of *Iridomyrmex*, *Azteca*, and *Engramma* inhabit the cavities of various myrmecophytic plants, and are undoubtedly adapted to this peculiar form of symbiosis. Other species of *Aztecæ* build carton nests, often of large size, which may be free, attached to branches or trunks of trees, or may be placed inside cavities; certain species are associated with epiphytes which cover their carton nests; according to Ule, these "gardening ants" carry soil and seeds of these epiphytes in the branches of the trees.

The Argentine ant, *Iridomyrmex humilis* (Mayr), is one of the most troublesome pests of tropical and subtropical countries. Its original home was South America, whence it has recently spread through a large part of the globe. It is sometimes found in hothouses of temperate regions. In the Ethiopian Region it has thus far been recorded from

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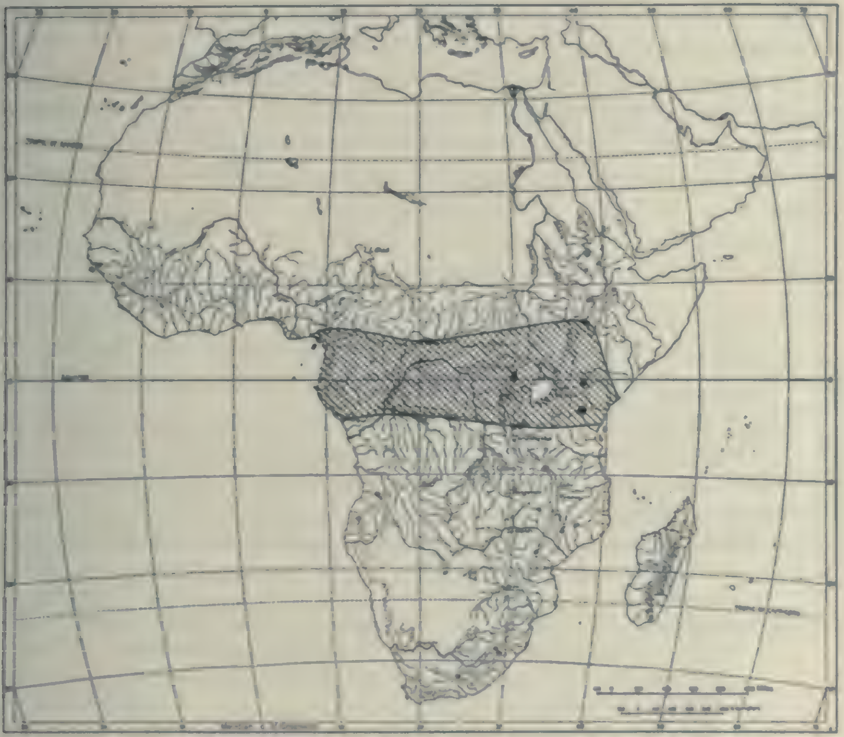
[1] Forel, 1878, 'Anatomie du gésier des fourmis,' Bull Soc Vaudoise Sc. Nat., XV, pp 339 362, Pl XXIII.

[2] Emery, 1888, 'Ueber den sogenannten Kaumagen einiger Ameisen,' Zeitschr. Wiss. Zool., XLVI, pp 378–412, Pls. XXVII-XXIX. 1912, 'Genera Insectorum, Dolichoderinæ,' pp 4–5. See also Wm. M. Wheeler, 1910, 'Ants,' pp. 33–35

South Africa only, where its appearance is said to date from the time of the last Boer War, when it was probably introduced with forage (Arnold). It is now a great pest in houses near Cape Town; it is also very injurious to fruit-trees.[1]



Map 31. Distribution of the genus *Engramma*.

ENGRAMMA Forel

Closely related to *Tapinoma*.

WORKER small, monomorphic, with the head more or less excised behind and the anterior border of the clypeus semicircularly notched in the middle and posteriorly extending back between the short but widely separated frontal carinæ. Maxillary palpi 4-jointed; labial palpi 3-jointed. Antennæ 12-jointed, with long first and last funicular joints. Gizzard with narrow, separated, anchor-like sepals. Gaster large, its first segment overlying the petiole; anus terminal or subterminal.

FEMALE larger than the worker; its fore wings with a discoidal, one cubital and a closed radial cell.

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[1] See the references given under this species in the catalogue of Ethiopian ants

Male as small as the worker, with 4-jointed labial and 5-jointed maxillary palpi. Antennæ long, filiform, 13-jointed, the scape as long as the first and second funicular joints together. Mandibles large, denticulate, decussating. Mesonotum not overarching the pronotum. Wings as in the female.

This genus has been known only since 1910 and comprises six described species. It has a very narrow range, being confined to equatorial Africa and in all probability to the forest regions (Map 31). Most of the species evidently live in the cavities of myrmecophytes. At least one, however, lives in the ground (*wolfi*) and another, *zimmeri* subspecies *okiavoënsis* of the Congo, is said to inhabit "a large pale gray nest, soft, woven and mixed with fine vegetable matter and applied to the trunk of a tree."

The workers of the previously known and of three new species described below may be separated by means of the following table.

1. Mesoëpinotal constriction very deep and long, so that the thorax is halteriform; epinotum with a pair of denticles above....... *denticulatum*, new species.
Mesoepinotal constriction only moderately deep, acute; epinotum without denticles..2.

2. Body long and slender; head and thorax opaque; antennal scapes extending at least one-fifth their length beyond the occipital border...............3.
Body more thickset; head and thorax shining; antennal scapes shorter......4.

3. Scapes surpassing the occiput by one-fifth their length; clypeal notch very large and deep and the median border behind it with a small triangular impression; all the funicular joints twice as long as broad; color black, with brown appendages...*wolfi* Forel.
Scapes surpassing the occipat by about one-fourth their length; clypeal notch broad and shallow, the median border without an impression; funicular joints shorter; color yellowish red, gaster black, its segments narrowly bordered with yellow..............................*zimmeri* Forel.

4. Eyes very large, nearly one-third as long as the sides of the head...*ilgi* Forel.
Eyes much smaller..5.

5. Head, without the mandibles, as broad as long, deeply excavated behind......6.
Head longer than broad, feebly excavated behind.......................8.

6. Antennal scapes slightly surpassing the occipital border; funicular joints 2 to 7 slightly longer than broad; base of epinotum nearly as long as the declivity, horizontal; pilosity well developed.......................*lujæ* Forel.
Antennal scapes not reaching the occipital border; funicular joints 2 to 7 broader than long; base of epinotum much shorter than the declivity, sloping forward; pilosity less abundant.................................7.

7. Brown; length 2.25 to 3 mm.............................*laurenti* Emery.
Dull yellow, with brown gaster; smaller, length 1.8 to 2.2 mm.....*kohli* Forel.

8. Antennal scapes reaching the occipital border; funicular joints 2 to 7 broader than long; epinotum evenly rounded, without distinct base and declivity. *griseopubens*, new species.

Antennal scapes extending about one-sixth their length beyond the occipital border; funicular joints all distinctly longer than broad; epinotum with short base sloping forward and long, flat declivity, sloping backward. ***gowdeyi*, new species.**

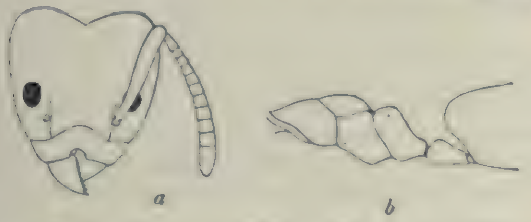


Fig. 48. ***Engramma kohli*** **Forel. Worker. *a*, head from above; *b*, thorax and petiole in profile.**

Engramma kohli Forel

Text Figure 48

Niapu, ☿, ♀ (Lang and Chapin); Lubutu to Kirundu, ☿; Tshopo River near Stanleyville, ☿ (J. Bequaert). The specimens from Niapu were taken in the leaf ascidiæ of *Scaphopetalum Thonneri* De Wildeman and Durand (see Part IV); those from Lubutu to Kirundu in the similar structures of *Cola Laurentii* De Wildeman (see Part IV); and those from the Tshopo River were found nesting in the stem swellings of a hairy *Plectronia* (species A, see Part IV). The type specimens of the species were also taken by Father Kohl "in myrmecophilous plants" at St. Gabriel, near Stanleyville.

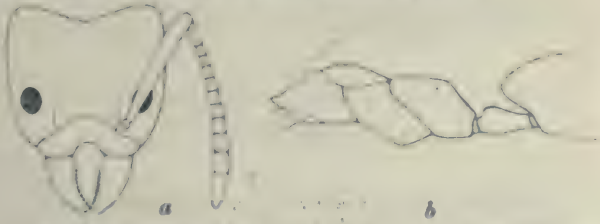


Fig. 49. ***Engramma lujæ*** **Forel. Worker. *a*, head from above; *b*, thorax and petiole in profile.**

Engramma lujæ Forel

Text Figure 49

A single worker of this species was found among the numerous specimens of the preceding species and was taken in the leaf-pouches of *Scaphopetalum Thonneri* at Niapu. I have compared it with a cotype of *lujæ* received from Prof. Forel and represented in the accompanying figure.

Engramma wolfi Forel

Text Figure 50

Akenge, ☿, ♀; Ngayu, ☿; Medje, ☿ (Lang and Chapin); Walikale to Lubutu, ♀, ♂ (J. Bequaert).

Female (undescribed).—

Length 4.6 to 5 mm.

Very similar to the worker. Head scarcely excavated behind. Eyes about two-fifths as long as the sides of the head. Clypeal border each side of the notch flattened and angularly projecting. Head and thorax a little more finely punctate and therefore a little more shining than in the worker. Epinotum feebly convex, sloping, without distinct base and declivity. Dark brown; mandibles, antennæ and wing-insertions pale brown; legs, including the coxæ, white, with a dark brown band around each femur and the tips of the hind coxæ of the same color. Wings grayish hyaline, with pale brown veins and pterostigma.

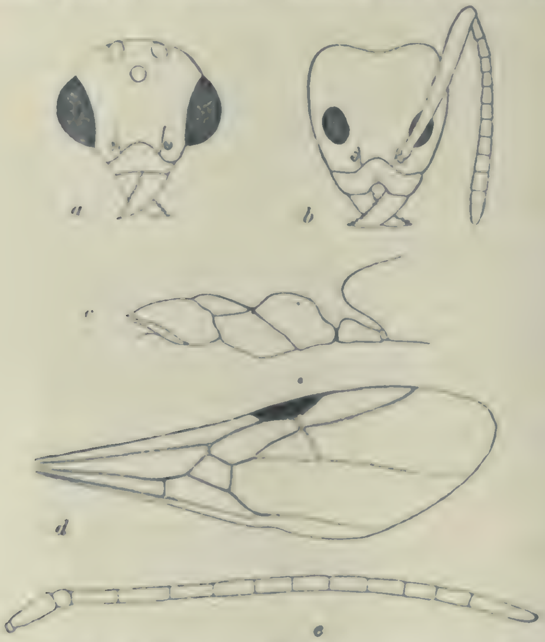


Fig. 50. *Engramma wolfi* Forel. *a*, head of male; *b*, head of worker; *c*, thorax and petiole of worker in profile; *d*, fore wing of female; *e*, antenna of male.

Male (undescribed).—

Length nearly 3 mm.

Head through the eyes as broad as long. Eyes and ocelli large. Mandibles well developed, decussating, with long, very finely and evenly denticulate apical borders. Clypeus short, with nearly straight, entire anterior border. Antennæ long and slender;

scape and all joints, except the first funicular, cylindrical; the latter as broad as long but not broader than the succeeding joints. Thorax short, not broader than the head; the mesonotum broader than long, not overhanging the pronotum. Epinotum sloping, without distinct base and declivity. Petiole with more distinct trace of the node at the anterior end than in the worker. Genitalia moderately large, exserted. Legs slender Wing venation as in the female.

Sculpture and pilosity much as in the female, the hairs and pubescence being very sparse and short, the former apparent only on the mouth-parts and tip of the gaster.

Dark brown; front of head and three large spots on the mesonotum pale rusty brown; mandibles pale yellowish; scapes, first funicular joint, and legs, including the coxæ, sordid white; the femora without brown bands. Wings and their veins a little paler than in the female.

The specimens from Akenge, Ngayu, and Medje (a female and four workers) were taken from the stomachs of toads (*Bufo polycercus, superciliaris*, and *funereus*), those from Walikale at lights. Kohl took the workers from which Forel described the species in the virgin forest in the ground among rotten leaves. This habit accounts for the occurrence of specimens in the toads' stomachs.

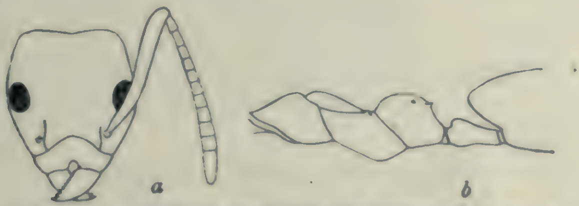


Fig. 51. *Engramma denticulatum*, new species. Worker. *a*, head from above; *b*, thorax and petiole in profile.

Engramma denticulatum, new species

Text Figure 51

WORKER.—

Length 2.6 mm.

Head subhexagonal, a little longer than broad and slightly broader behind than in front, with the sides subangulate in the middle and the posterior border feebly concave. Eyes moderately large, near the middle of the sides. Mandibles rather small, convex, with three large apical and several small basal teeth. Clypeal notch small, semicircular, less than one-fifth as long as the anterior border, with sharp corners. Frontal area indistinct; frontal groove obsolete. Antennal scapes extending somewhat farther than their greatest diameter beyond the posterior corners of the head; first funicular joint as long as the two succeeding joints together; joints 2 to 7 about one and one-half times as long as broad, joints 8 to 10 slightly longer than broad. Thorax long, with very deep and broad mesoëpinotal constriction so that it is dumb-bell-shaped, the pronotum and mesonotum convex and hemispherical above, the impression bearing the prominent metathoracic spiracles, the epinotum high and convex like the promesonotum, with two blunt denticles and prominent spiracles. Petiole stout, through the distinct node-like thickening at its anterior end nearly half as high as long. Gaster shaped as in the other species of the genus, with the first segment overlying the petiole; anus terminal.

Shining; head and clypeus finely but distinctly longitudinally aciculate; mandibles smooth, with coarse, scattered punctures; pronotum finely and indistinctly punctate; meso- and epinotum opaque, densely and rather coarsely punctate; gaster finely reticulate.

Pilosity and pubescence very sparse, the latter distinct only on the appendages.

Deep castaneous, nearly black; apical portions of mandibles, bases of scapes, terminal tarsal joints and petiole yellowish.

Described from two specimens taken by Lang and Chapin between Lukolela and Basoko on fire-wood. Two imperfectly preserved specimens were taken by Bequaert at Masaki, between Masisi and Walikale, from the caulinary swellings of a *Cuviera* (probably *C. angolensis*; Part IV).

This is a very strongly marked species on account of the peculiar shape of the thorax, the two denticles of the epinotum, and the peculiar sculpture of the head and thorax.

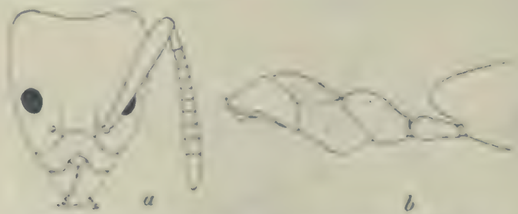


Fig. 52. *Engramma griseopubens*, new species. Worker. *a*, head from above; *b*, thorax and petiole in profile.

Engramma griseopubens, new species

Text Figure 52

WORKER.—

Length 2.7 mm.

Head without the mandibles slightly longer than broad, much broader behind than in front, with somewhat angularly excised posterior border and feebly convex sides. Eyes small and flat, in front of the middle of the head. Mandibles rather large, convex, their long apical margins with numerous crowded denticles. Clypeal notch semicircular, about one-fifth as broad as the anterior margin. Frontal carinæ somewhat closer together than to the lateral margins of the head. Frontal area and groove obsolete. Antennæ rather slender, scapes not reaching to the posterior corners of the head; first funicular joint twice as long as broad, remaining joints except the last, as broad as long. Thorax with sharply marked promesonotal and mesoëpinotal sutures, the pro- and mesonotum forming a hemispherical mass, the latter circular, the humeri rounded; the mesoëpinotal constriction moderately deep, acute; the epinotum lower than the promesonotum, only a little longer than the mesonotum, broader than long, in profile rather convex, sloping, without distinct base and declivity.

Petiole of the usual shape, elliptical, with its anterior border thickened above as the vestige of the node. First gastric segment overlying the petiole as in the other species of the genus; anus nearly terminal. Legs rather slender.

Shining; whole body very finely and uniformly punctate.

Hairs absent, except on the mandibles and tip of the gaster, where they are very short. Pubescence gray, short and fine, rather abundant, uniformly covering the whole body, but not concealing the surface.

Black; mandibles, sides of clypeus, cheeks and gula brown.

Described from a single specimen taken by Lang and Chapin on fire-wood between Lukolela and Basoko. This species is quite distinct in the shape of the thorax, in sculpture, and in pilosity.

The following species, though not from the Congo, may be most conveniently described in this place.

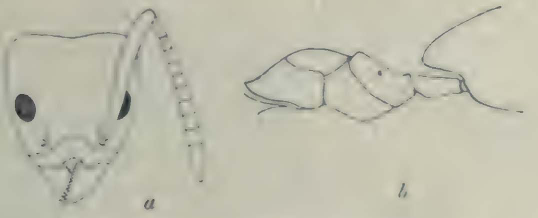


Fig. 53. *Engramma gowdeyi*, new species. Worker. *a*, head from above; *b*, thorax and petiole in profile.

Engramma gowdeyi, new species

Text Figure 53

WORKER.—

Length 2.4 to 2.7 mm.

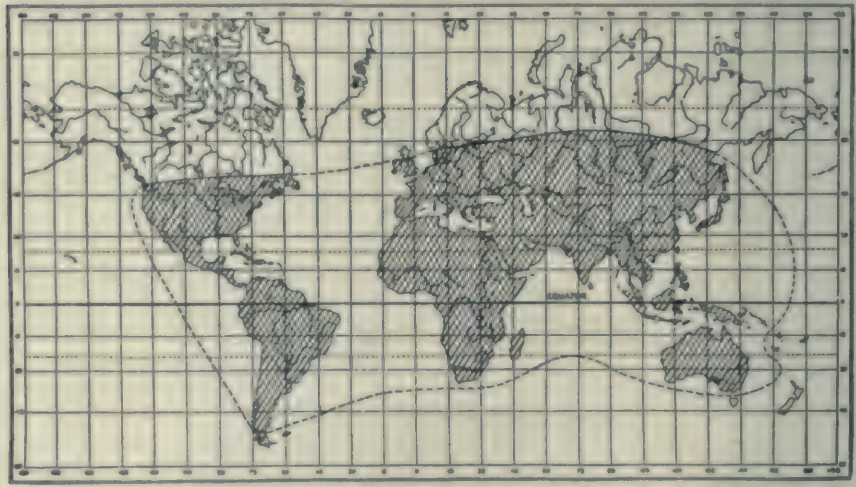
Head without the mandibles distinctly longer than broad, broader behind than in front, with feebly concave posterior border and feebly convex sides. Eyes flat, in front of the middle of the head, about one-fifth as long as its sides. Mandibles convex, with about a dozen even, crowded teeth. Clypeal notch about one-fourth the length of the anterior border, broader than deep, with sharp, slightly produced corners. Posterior clypeal border distinct; frontal area and groove obsolete; frontal carinæ nearer to the sides of the head than to each other. Antennal scapes extending about one-sixth their length beyond the occipital border; funicular joints 2 to 10 perceptibly longer than broad. Thorax short, seen from above with distinctly angular humeri; promesonotal and mesoëpinotal sutures distinct; pro- and mesonotum moderately convex, the latter broadly elliptical, slightly broader than long; mesoëpinotal constriction rather deep, acute; epinotum as long as broad, broader behind than in front, in profile with a short base, rising rather steeply from the mesoëpinotal suture, one-fourth as long as the flat, backwardly sloping declivity. Petiole elliptical, flat, its node obsolete. Gaster rather voluminous, its first segment overlying the petiole; anus terminal. Legs rather slender.

Shining; very finely and uniformly punctate.

Hairs sparse, blackish, erect, rather coarse, present on the clypeus, vertex, pro-, meso-, and epinotum, and all the segments of the gaster. Pubescence grayish, short and fine, rather abundant, covering the whole body but not concealing the shining surface.

Castaneous brown; thorax and anterior portion of head paler; mandibles, insertions of antennæ, funiculi, tarsi, and articulations of legs yellowish brown.

Described from numerous specimens taken by Mr. C. C. Gowdey at Kampala, Uganda. I at first supposed this form to be *E. ilgi* subspecies *stygium* Santschi, described from British East Africa, but careful perusal of the description shows that it is quite distinct.



Map 32. Distribution of the genus *Tapinoma*.

TAPINOMA Förster

WORKER small, monomorphic, with 4-jointed labial and 6-jointed maxillary palpi, multidenticulate mandibles, 12-jointed antennæ and entire or medially more or less emarginate clypeus. The node is reduced to an anterior thickening of the depressed or flattened petiole which is overlain by the first gastric segment; anus usually inferior. Gizzard short, calyx usually not divided into distinct sepals, feebly convex, covered with fine hairs, with the bulb almost exposed when viewed from the side.

The FEMALE is usually considerably larger than the male. The anterior wings have a single cubital cell, rarely two, and the discoidal cell is often lacking.

The MALE is commonly as small as the worker and has well-developed denticulate mandibles. Antennæ filiform, with long scape, usually surpassing the posterior border of the head and as long as the three first funicular joints together. Thorax stout; mesonotum not overhanging the pronotum. Genital appendages voluminous, the stipes with a large squamula and its free portion of variable shape. Wings as in the female, but the discoidal cell is often lacking in the smaller species.

Colonies of *Tapinoma* are usually populous and live in the ground or in the cavities of plants. The workers are timid and emit from their anal glands a strong odor like that of rancid butter ("*Tapinoma*-odor"). The genus is cosmopolitan and in the Nearctic Region reaches to rather high latitudes and altitudes (Map 32). One of the species, *Tapinoma melanocephalum*, has been widely distributed by commerce throughout the tropics of both hemispheres. It is often a pest in shops and is known in Cuba as the "hormiga bottegaria."

Tapinoma luridum Emery subspecies **longiceps,** new subspecies

WORKER.—2.5 to 3 mm. Larger than the typical form and the subspecies *connexum* Santschi and differing also in the following characters. The head is longer, narrower behind and the posterior border is straight, not convex, as figured by Santschi for *connexum*, nor concave, as described by Emery for the type. The anterior clypeal border is straight in the middle, not feebly notched, and the scapes surpass the occipital border by nearly a third of their length. The eyes are decidedly smaller than in either of the other forms of the species. The thorax and petiole agree with Santschi's figure of *connexum*. The body is uniformly lustrous or moderately shining, the pilosity as described by Emery for the type, the pubescence exceedingly fine so that it somewhat dims the shining surface. The color is uniformly brown, except the tarsi, which are pale brownish yellow.

Described from numerous specimens found by Lang, Chapin, and Bequaert nesting in a deserted carton termitarium on a tree on the forested bank of the Congo River at Zambi. This form is so distinct that it may prove to be an independent species.

TECHNOMYRMEX Mayr

Allied to *Tapinoma* and distinguished by the peculiar structure of the gizzard, the calyx of which is covered with small clear spots apparently representing thin areas in the chitin. The anus is terminal in the WORKER and FEMALE. The former is small and monomorphic, the latter but little larger. The anterior wings have two closed cubital cells and a discoidal cell.

The MALE has a short antennal scape, not longer than the two first joints of the funiculus. Wings like those of the female, but with the cubital vein more or less interrupted near the second cubital cell. In one species, *T. albipes*, both apterous and winged males are known to occur.

The genus is confined to the Old World tropics, ranging over the Ethiopian, Indomalayan, Papuan, and Australian Regions (Map 33). Some of the species nest in the ground, others make small carton nests on the bark of trees. *T. albipes* is being rapidly disseminated in the tropics by commerce and sometimes occurs in hothouses in temperate regions.

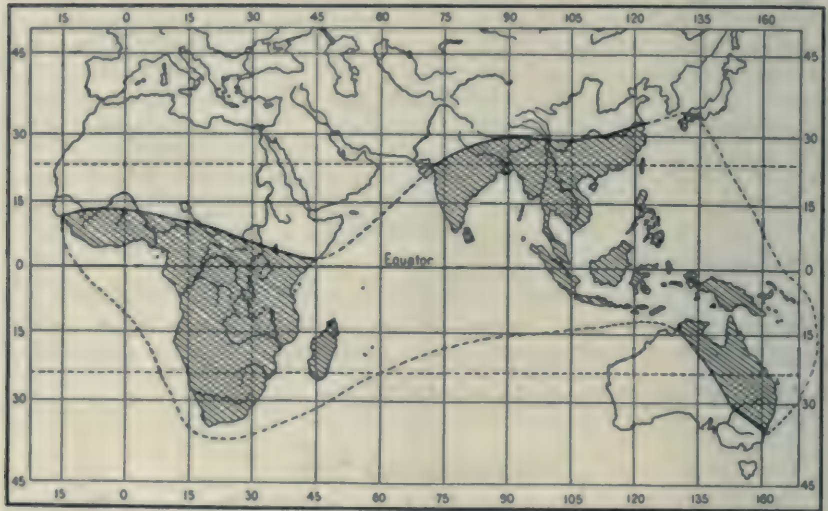
Technomyrmex nigriventris Santschi

Two workers taken by J. Bequaert at Thysville "beneath decaying leaves on the soil of a patch of forest."

Formicinæ

(Camponotinæ of authors)

WORKER monomorphic or more or less polymorphic, only in a few cases with pronounced dimorphism (*Dimorphomyrmex*). Frontal carinæ often feebly developed and the clypeus is only exceptionally produced between them (*Dimorphomyrmex*, *Gesomyrmex*); even then, it is not properly wedged in. Antennæ 8- to 12-jointed, usually long and filiform; the funiculus rarely with a feeble 4- or 5-jointed club. Abdominal pedicel always formed by one segment, the petiole, which is usually scale-like; there is never a trace of constriction between the second and third abdominal segments and the stridulatory organ is also lacking at the base of the third segment. Sting vestigial; the poison-glands are converted into a cushion of convolutions (Forel's pulviniferous vesicle); the sting forms merely the sustentacular apparatus for the orifice of this poison vesicle. The ejaculation of the poison can in certain genera (*Formica*) be effected with great force. Orifice of the cloaca always circular and terminal, ciliated round the margin.



Map 33. Distribution of the genus *Technomyrmex*.

FEMALE always winged and similar to the worker, though of much larger size.

MALE winged, with the genitalia always exserted.

The venation of the wings is more or less reduced, often considerably so. In its most primitive stage there is still one cubital, a closed radial, and a closed discoidal cell; but there is no intercubitus, the radius and cubitus being confluent over a part of their course (*Formica*-type). Reduction has usually started by the disappearance of the recurrent vein, there being no discoidal cell (*Camponotus*, *Œcophylla*). An intercubitus is only rarely present and then very short (*Myrmoteras*, which has the most primitive venation of this subfamily).

Nymphs usually enclosed in cocoons; but there are some exceptions (*Œcophylla*, *Prenolepis*).

The members of this subfamily are morphologically the most highly developed of all ants; this is also true for their ethological peculiarities. Not only are their habits very diverse, but they show the most specialized form of mental and social behavior. The diet is in large part vegetarian and these ants show great predilection for sugary substances, which are sometimes stored in a special, replete form of worker (honey ants: *Melophorus*, *Myrmecocystus*, certain *Plagiolepis*, etc.). The species of *Œcophylla* and certain *Polyrhachis* and *Camponotus* build silk nests in leaves, using their larvæ as silk-producing shuttles. Moreover, the nesting habits in this subfamily are very varied. Certain species of *Formica* and *Polyergus* are slave-makers; the species of *Polyergus* are true social parasites of *Formica*, entirely dependent upon their slaves, but the worker caste is still present.

PLAGIOLEPIS Mayr

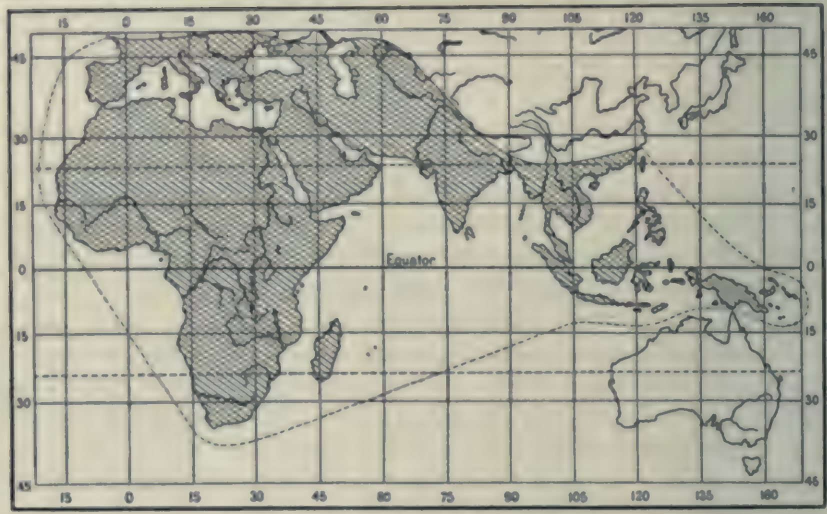
Worker medium-sized to very small, monomorphic or feebly polymorphic. Mandibles rather narrow, with oblique, usually 5-toothed, apical borders. Clypeus large, convex, carinate or subcarinate, lozenge-shaped, its anterior border arched and projecting somewhat over the bases of the mandibles. Maxillary palpi 6-jointed, labial palpi 4-jointed. Frontal carinæ short, subparallel, rather far apart. Frontal area poorly defined. Antennæ 11-jointed, inserted very near the clypeal suture, the funiculi slender, gradually thickened towards their tips, the first joint long, the remaining joints gradually lengthening distally, the terminal joint elongate. Eyes moderately large and flat, placed in front of the middle of the head. Ocelli usually absent. Thorax short, more or less constricted in the mesonotal region, the epinotum simple and unarmed. Petiole with its scale anteriorly inclined, its superior border entire. Gaster rather voluminous, elliptical. Legs slender. Gizzard with the calyx strongly reflexed, parasol-shaped.

Female much larger than the worker. Head small, thorax and gaster massive, the mesonotum somewhat flattened above, the gaster elliptical. Antennæ 11-jointed. Wings long, with one cubital cell and usually without a discoidal cell.

Male somewhat smaller than the female. Mandibles acutely toothed. Frontal area large. Antennæ 12-jointed, with long scapes; funiculi with elongate first joint. Thorax voluminous, mesonotum large, flattened above, covering the small pronotum. Petiole as in the female. External genital valves large, rounded. Wings as in the female.

Pupæ enclosed in cocoons.

This genus is peculiar to the warmer parts of the Old World (Maps 34 and 35) and is represented by the largest and most numerous species in the Ethiopian Region. Two of the latter, *P. custodiens* and *stein-*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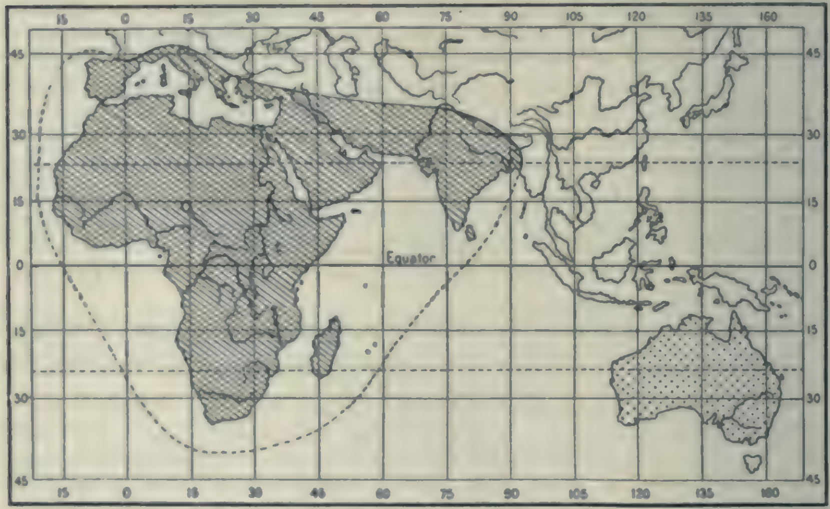
Map 34. Distribution of the genus *Plagiolepis*.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Map 35. Distribution of the subgenus *Anacantholepis* (crossed area) of *Plagiolepis* and of the allied genus *Stigmacros* (dotted area) *gröveri*, resemble our northern species of *Formica* in stature and structure. A single medium-sized species, *P. longipes* (Jerdon), has been widely distributed by commerce in the Old World tropics and has also gained a footing in Mexico. Another species, *P. nuptialis* Santschi, recently discovered by Dr. Hans Brauns in the Cape Province, is parasitic on *P. custodiens* (*vide infra*). So far as known, the species of *Plagiolepis* nest in the ground, making crater nests or tunneling under stones, with the single exception of *P. mediorufa*, which inhabits plant-cavities.

Santschi has recently separated the genus into three subgenera: *Plagiolepis, sensu stricto, Anacantholepis*, and *Anoplolepis*, on the structure of the mesonotum.

Plagiolepis mediorufa (Forel)

Numerous workers from Stanleyville (Lang and Chapin), taken from the leaf-pouches of *Cola Laurentii*. This form was originally described as a simple variety of the Palearctic *P. pygmæa* (Latreille), from specimens taken by Kohl "dans une plante myrmécophile," near Stanleyville. It should, in my opinion, be regarded as a distinct species on account of its peculiar habitat, for *pygmæa* nests in the soil under stones. Moreover, the worker *mediorufa* is decidedly smaller, with much shorter antennæ, the median funicular joints especially being distinctly shorter than long, whereas in *pygmæa* they are longer than broad. The head is proportionally smaller and narrower, with more rounded sides and with the occipital border straight or slightly convex, not concave as in *pygmæa*.

Plagiolepis (**Anoplolepis**) **custodiens** (F. Smith)

Plate XIX, Figures 1 and 2

Banana, ☿, ♀, ♂; San Antonio, ☿ (Lang and Chapin).

At Banana this species was found nesting in flat craters in the pure sand of the sea-beach (Pl. XIX, figs. 1 and 2). According to a note by Mr. Lang, "the ants were found very near the water, where the sand was moved by the wind or even inundated by the breakers. Only a slight excavation, marking the entrance of the nest, was visible, and it was difficult to trace out the galleries. These ants carry particles of sand considerable distances, sometimes two or three feet from the nest-entrances. They work during the day-time and retreat into their nests when disturbed."

P. custodiens has been previously taken in Banana by Busschodts and in Angola by Silvestri, and is well known from other parts of the Ethiopian Region as far north as Abyssinia and as far south as the Cape.

It is the host of *P. nuptialis* Santschi, which was discovered by Dr. Brauns at Willowmore, Cape Province. Up to the present time only males of this ant have been taken. Dr. Brauns, who sent me a series of them, writes me March 24, 1920, as follows: "I am well aware of the interest attaching to the parasitic habits of *P. nuptialis.* Hitherto I have been unable to discover the female, but hope to unearth it eventually. The males always come out of the nests of *P. custodiens* and most years are not uncommon at Willowmore. I also found the male flying in numerous swarms over the Keurbooms River on the coast, near Plettenberg Bay, during a rain-storm, but could nowhere find them *in copula* with females. Perhaps the female is unable to fly! The males often remain for months at a time in the *custodiens* nests before swarming, which occurs only during a shower. The nests of *P. custodiens* and *steingröveri* are frequently close together, but the latter does not harbor *nuptialis*, though both species usually have the same myrmecophiles. At Willowmore *steingröveri* is showing a tendency to displace *custodiens.*" It would seem from Dr. Brauns' observations that *nuptialis*, like the North American species of *Epœcus*, *Sympheidole*, and *Epipheidole*, must be a workerless parasite.

Plagiolepis (Anoplolepis) tenella Santschi

Niapu, ☿; Bafwasende, ☿; Garamba, ☿, ♂; Akenge, ☿; Medje, ☿ (Lang and Chapin). The specimens from Akenge and Medje were taken from the stomachs of toads (*Bufo funereus* and *polycercus*) and two males from Garamba from the stomach of a *Bufo regularis.* The Niapu specimens were found running about on the ground in the clearing of a native village.

The female of this species was mentioned by Forel from specimens found in the stomach of a pangolin (*Manis temmincki*) from the Lower Congo, but was not described. The hitherto undescribed male measures about 5 mm. The wings are long (6 mm.). The head is only about half as broad as the thorax, broader through the eyes than long, with small, acutely 5-toothed mandibles. Color, sculpture and pilosity as in the worker, but the head is dark brown behind and the thorax is more shining, with three obscure, brownish, longitudinal blotches on the mesonotum.

ACANTHOLEPIS Mayr

WORKER small, monomorphic. Head subquadrate, rounded laterally and posteriorly. Mandibles with oblique, dentate apical borders. Clypeus broad and high, carinate or subcarinate. Clypeal and antennary foveæ confluent. Frontal area small but distinct, triangular. Frontal carinæ subparallel, short, rather far apart. Maxillary palpi 6-jointed, labial palpi 4-jointed. Antennæ 11-jointed, inserted close to the clypeal suture; scapes long, funiculi slender, not thickened distally. Eyes moderately large, ocelli distinct, rather far apart. Thorax constricted at the mesonotum, the pronotum broad and usually convex anteriorly, somewhat compressed posteriorly; promesonotal and mesoëpinotal sutures distinct; epinotum more or less swollen and obtusely dentate on each side. Petiolar scale bidentate or more or less excised above. Gaster broadly oval, with rather pointed tip. Legs slender. Gizzard much like that of *Plagiolepis*.

FEMALE larger than the worker. Head resembling that of the worker but broadened behind. Thorax robust, mesonotum large, gibbous in front where it overhangs the pronotum, obscurely longitudinally carinate in the middle as is also the scutellum. Epinotum unarmed or bluntly dentate. Wings with a single cubital cell and usually without a discoidal cell.

MALE scarcely larger than the worker and resembling that caste in the shape of the head. Eyes large, cheeks very short. Antennæ 12-jointed; scapes long and slender; funiculi filiform, all the joints elongate, the first shorter than the two following together. Thorax massive, about as broad as high; epinotum oblique, unarmed; mesonotum slightly convex but not subcarinate. Petiolar scale inclined forward, its upper border entire. External genital valves small, elongate, triangular. Wings long and broad.

PUPÆ enclosed in cocoons.

Like *Plagiolepis*, the genus *Acantholepis* is confined to the warm parts of the Old World, one species, *A. frauenfeldi* (Mayr), occurring as far north as southern Europe, Syria, and Persia. In Australia the genus is represented by a peculiar group of species, *Stigmacros*, which Forel regards as a subgenus but which, I am inclined to believe, should be raised to generic rank. The colonies of *Acantholepis* are moderately populous and usually nest in the ground, under stones, or in the fissures of rocks, rarely in the cavities of plants.

Acantholepis capensis Mayr variety **anceps** Forel

Stanleyville, ☿; Medje, ☿ (Lang and Chapin). Numerous specimens. This variety is close to the subspecies *depilis*, having sparse, short, whitish pilosity. In shape the epinotum and scale, as Forel remarks, approach those of the subspecies *simplex* Forel. The variety was originally described from specimens taken by Kohl in the Belgian Congo, probably near Stanleyville. According to a note by Mr. Lang, this ant makes tiny craters in the soil after the rain. The colonies seem to be rather small, judging from the few workers seen outside the nests.

Acantholepis capensis variety **guineensis** Mayr

A single worker from Thysville (Lang and Chapin) appears to belong to this variety, which is not black, like the other forms of the species, but reddish brown. The hairs are yellowish. It was originally described from the Gold Coast.

Acantholepis capensis variety **validiuscula** Emery

Thysville, ☿ (J. Bequaert, Lang and Chapin). Five specimens. This variety is decidedly larger and more robust than the typical *capensis*, with abundant, erect, dark brown pilosity. It seems to have a wide distribution, since it is known from Abyssinia, the Congo, Rhodesia, and Cape Province.

Acantholepis capensis subspecies **canescens** (Emery)

Thysville, ☿ (J. Bequaert); Avakubi, ☿ (Lang and Chapin). A form with long, white pilosity and abundant pubescence, distributed throughout the Ethiopian Region. A note by Mr. Lang states that "these small ants had their nest in the dirt which had accumulated at the bases of the cut leaves on the stem of an oil palm. They were numerous and travelled continually up and down, one by one, without forming a regular file. There were numerous nests along the trunk of the palm, but all of them were situated in the higher portion of the hollowed, partly decomposed stumps of the leaf-stalks, which had been cut off for some time. These hollows had evidently been made by the ants themselves."

Acantholepis capensis subspecies **canescens** variety **cacozela** Santschi

Faradje, ☿ (Lang and Chapin). Four workers taken from the hollow stems of an unidentified plant belonging to the family Melastomaceæ (*Dissotis*). This variety has longer hairs than the typical *canescens* and the petiolar scale is thickened at the summit, with scarcely excised border.

Acantholepis carbonaria Emery

Two workers from Banana (Lang and Chapin), without further data. This opaque species, originally described from Somaliland, has also been previously taken in the Belgian Congo.

Prenolepis Mayr

Worker small to very small, monomorphic, the body, legs, and scapes usually beset with sparse, coarse, erect, blunt hairs. Head rounded subrectangular or subelliptical, with rather narrow, dentate mandibles, their apical borders oblique. Clypeus large, convex, its anterior border entire or sinuately emarginate in the middle, not or scarcely produced over the bases of the mandibles. Frontal carinæ very short and straight; frontal area poorly defined. Antennary and clypeal fossæ not confluent. Maxillary palpi 6-jointed; labial palpi 4-jointed. Antennæ 12-jointed, inserted near the posterior angles of the clypeus; scapes elongate, funiculi filiform or slightly thickened distally. Eyes moderately large; ocelli absent. Thorax short, more or less constricted in the mesonotal region. In some species the mesonotum is elongate and subcylindrical. Promesonotal and mesoëpinotal sutures distinct. Epinotum more or less convex above, unarmed. Petiole with an anteroposteriorly compressed scale, which is inclined forward. Gaster oval, convex in front, where the first segment covers the petiole, the tip pointed. Legs slender. Gizzard long and narrow, its calyx straight at the base, with the sepals reflected at their anterior tips.

FEMALE decidedly larger than the worker. Head proportionally small; thorax and gaster massive; pronotum short, vertical; mesonotum broad, flattened, with distinct parapsidal furrows; scutellum convex, often longitudinally impressed in the middle. Wings with a single cubital cell; discoidal cell present or lacking.

MALE scarcely larger than the worker. Head resembling that of the worker and female. Mandibles usually edentate. Antennæ 13-jointed; scapes rather long; funiculi filiform. Petiolar node thick. Genital valves rather small and narrow, varying conside ably in the details of their structure in different species. Wings as in the female.

The PUPÆ are not enclosed in cocoons.

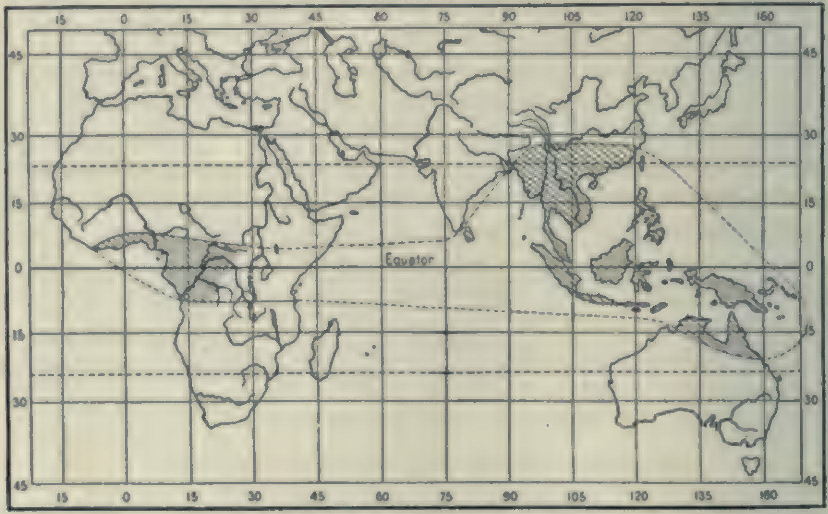
This genus is cosmopolitan, but most abundantly represented in the Indomalayan and Neotropical Regions. There are few species in Africa. Two, *P. longicornis* and *vividula*, have been widely distributed by commerce and, though originally tropical, often manage to live permanently in northern hothouses or even in apartment houses that are heated throughout the winter. Nearly all the members of the genus nest in the ground in small craters or under stones and usually form only moderately populous colonies. They are timid, harmless ants of little or no economic importance. Emery has divided the genus into three subgenera: *Prenolepis, sensu stricto, Euprenolepis*, and *Nylanderia*, the last containing the great majority of the species.

Prenolepis (**Nylanderia**) **longicornis** (Latreille)

Stanleyville, ☿, ♀; Zambi, ☿, ♀ (Lang and Chapin). Numerous specimens showing some variation in color. The forms with paler workers might be assigned to Forel's variety *hagemanni*, originally described from Boma, in the Belgian Congo, but of the few distinguishing characters mentioned by the Swiss myrmecologist, the whiteness of the hairs is noticeable in all the *longicornis* workers I have seen from various parts of the world and the body color varies even in the same colony. These facts and a study of a cotype of *hagemanni* received from Prof. Forel convince me that the name should be relegated to the synonymy. Forel believed that his *hagemanni* might be the worker of Emery's *P. waelbroecki*, described from female and male specimens, but the females accompanying pale *longicornis* workers from Stanleyville and Zambi are the same as those accompanying darker workers from other localities in the East Indies and tropical America and do not agree with Emery's description of the *waelbroecki* female, which is larger, ferruginous instead of dark brown, more hairy, with a much broader head, larger eyes and shorter antennal scapes.

Prenolepis (Nylanderia) vividula (Nylander)

Niapu, ☿, ♀ (Lang and Chapin). Although this species is being rapidly disseminated by commerce throughout the tropics of both hemispheres and has long been known to occur in northern hothouses, it has not before been recorded from the Ethiopian Region. The workers before me are a little darker than typical specimens, but the differences are too insignificant to justify a new varietal name.



Map 36. Distribution of the genus *Pseudolasius*.

PSEUDOLASIUS Emery

WORKER small, polymorphic, the head of the major being large and differently shaped from that of the minor. Mandibles well developed, with oblique apical borders furnished with 5 to 6, more rarely with 7 to 8 teeth of different sizes. Clypeus large, convex, and more or less carinate in the middle, its anterior border projecting somewhat over the bases of the mandibles. Frontal area indistinct, triangular; frontal carinæ short, subparallel, rather widely separated; frontal groove indicated. Clypeal and antennary fossæ confluent. Head of major worker cordate or subrectangular, deeply emarginate posteriorly; in the minor worker much less deeply concave behind. Eyes small to very small, rarely completely lacking; ocelli absent. Antennæ 12-jointed, inserted near the clypeal suture; funiculi filiform, slightly thickened towards their tips. Thorax short, stout; promesonotal and mesoëpinotal sutures distinct; pro- and mesonotum convex above, mesonotum impressed; epinotum short, unarmed, with short base and long sloping declivity. Petiolar scale suberect or inclined forward, its apical border emarginate or entire. Gaster short, elliptical. Legs moderately long and stout.

FEMALE considerably larger than the worker. Head similar to that of the worker major but broader behind, with well-developed eyes and antennæ. Thorax broader than the head, the mesonotum flattened above, the pronotum short and vertical. Wings long and ample, with a single large cubital and no discoidal cell.

MALE as small as the worker and of a similar color. Mandibles dentate. Eyes and ocelli large. Antennæ 13-jointed; scapes long, funiculi filiform, all their joints longer than broad. Thorax similar to that of the female; gaster more slender; external genital appendages rather narrow, hairy. Wings long and broad; venation as in the female.

Until recently these ants were supposed to be peculiar to the Indomalayan Region, but Forel has described a species from Australia and Santschi has described one from the French Congo (Map 36). Emery[1] has keyed all the species known up to 1911, but several Indonesian forms have since been described. The African material before me comprises four species, one of which I refer to *P. weissi* Santschi, the other three being undescribed. Two of the latter were taken by Lang and Chapin in the Belgian Congo, one by Mr. Gowdey in Uganda. All these forms have very poorly developed eyes, compared with the majority of Indomalayan species. Further search will probably reveal many additional species in the Ethiopian Region. The workers are hypogæic or nocturnal and are therefore rarely seen; the males and females, however, are not infrequently taken at lights.

Pseudolasius weissi Santschi variety **sordidus** Santschi

Text Figure 54

To this variety I refer a major and six minor workers and two partly deälated females taken from the stomachs of toads captured by Lang and Chapin at Akenge. Owing to the fact that both females were taken from a *Bufo polycercus*, while the workers were taken from a *B. funereus*, I cannot be certain that the specimens belong to the same species. The females are of the same size as those of the typical *weissi* (6.5 mm., the fore wings nearly 7.5 mm.). The eyes are elliptical and obliquely placed, but distinctly smaller than indicated in Santschi's description; the wings are paler, being rather uniformly brown, with dark brown veins and pterostigma.

I have figured the head of the worker major and minor. The eyes, as Santschi says, are present only in the former and are very small and slightly elongate. In one of the mediæ I find them reduced to a single ommatidium. The apical border of the petiole is slightly concave in larger, entire in smaller workers. The color seems to be somewhat darker than described by Santschi for his variety *sordidus*, but this may be due to the action of the gastric juices of the toads.

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[1] 1911, Ann. Soc. Ent. Belgique, LV, p. 214.

Pseudolasius bufonum, new species

Text Figure 55

WORKER MAJOR.—

Length 2.8 to 3 mm.

Head scarcely longer than broad, subrectangular, with nearly straight, subparallel sides and sinuately excised posterior border. Mandibles 5-toothed, the median tooth small, the apical long and pointed, the others shorter and subequal. Clypeus convex, subcarinate in the middle, its anterior border entire, only slightly projecting over the bases of the mandibles. Eyes very small, consisting of only three or four ommatidia, situated a little in front of the median transverse diameter of the head. Antennal scapes not reaching to the posterior corners of the head; first funicular joint longer than the two succeeding joints together; second joint as broad as long, joints 3 to 7 slightly longer than broad. Thorax short, stout; pronotum large and broad, longer than the mesonotum, which is as long as broad; epinotum broader than long. In profile the pro- and mesonotum form a large convexity with rather uneven outline, interrupted by the strong promesonotal suture. Mesoëpinotal impression short and not very deep, the stigmata prominent. Epinotum decidedly lower than the mesonotum, in profile rounded and sloping, with very short base and long sloping declivity. Petiole small, rather strongly compressed antero-posteriorly, with entire superior border. Gaster elongate elliptical. Legs rather stout.

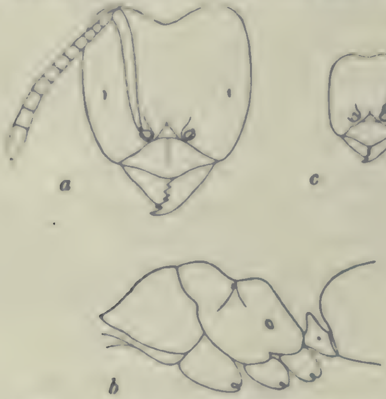


Fig. 54. ***Pseudolasius weissi* variety *sordidus* Santschi.** ***a*, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor.**

Mandibles opaque, very finely and longitudinally striated. Remainder of body shining, very finely and rather densely punctate, but not more coarsely on the head and thorax than on the gaster. Clypeus smoother and more shining than the remainder of the head.

Hairs and pubescence yellowish, abundant; the former erect, longest on the thoracic dorsum, sparser and shorter on the scapes and legs; pubescence rather long and dense over the whole body but only slightly obscuring the shining surface.

Yellowish brown; gaster and appendages paler and more yellow; mandibles castaneous, their teeth and a blotch on the vertex blackish.

WORKER MINOR.—

Length 2.5 to 3 mm.

Differing from the major worker in the shape of the head, which is decidedly smaller, distinctly longer than broad, with straight sides and only feebly excised posterior border. Eyes reduced to a single ommatidium or absent. Antennal scapes reaching to the posterior corners of the head; first funicular joint broader than long, joints 3 to 7 not longer than broad.

Sculpture, pilosity, and color as in the major worker, but the black spot on the vertex fainter or altogether absent.

FEMALE.—

Length 5.5 to 6 mm.

Head, excluding the mandibles, broader than long, slightly broader behind than in front, with feebly convex sides and broadly and feebly excised posterior border. Eyes slightly convex, very broadly elliptical, occupying the median third of the sides of the head. Antennal scapes extending nearly one-third their length beyond the posterior corners of the head; all the funicular joints longer than broad. Thorax broader than the head; the mesonotum and scutellum flattened. Apical border of petiole blunt, straight, and transverse. Gaster large, elliptical. Wings long.

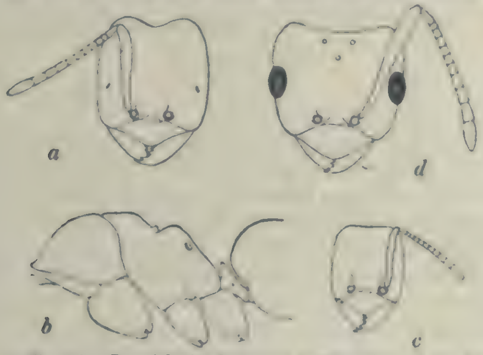


Fig. 55. ***Pseudolasius bufonum*, new species. *a*, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor; *d*, head of female.**

Sculpture, pilosity, and color much as in the worker, but the body darker brown, the gaster not paler than the thorax. Anterior border of clypeus blackish. Hairs lacking (possibly rubbed off), pubescence shorter and more delicate, and the surface, especially of the head and thorax, somewhat more opaque than in the worker. Wings blackish, with dark brown veins and pterostigma.

MALE.—

Length 2.5 mm.

Head as broad as long, somewhat narrowed behind and in front. Eyes convex, hemispherical, somewhat in front of the middle of the sides, the posterior border nearly straight. Mandibles denticulate, overlapping. Clypeus convex. Antennal scapes extending about one-fourth their length beyond the posterior border of the head; all the funicular joints distinctly longer than broad, the first nearly as long as the two succeeding joints together. Thorax and petiole shaped somewhat as in the female. Gaster and legs slender, external genital valves rather long and pointed.

Sculpture and pilosity much as in the worker. Color yellowish brown above, with brownish yellow appendages, genitalia, venter, and anterior portion of head. Ocellar triangle dark brown. Wings paler than in the female.

Described from four major and eleven minor workers, three females, and eight males, all taken from the stomachs of toads (*Bufo superciliaris* and *polycercus*) captured at Medje (Lang and Chapin).

This species differs from *weissi* in the shape of the head of the major worker, the slightly larger eyes, more strongly striated and more opaque mandibles, shorter antennæ, and much more abundant pilosity and pubescence, and especially in having erect hairs on the scapes and legs. The female is smaller than that of *weissi*, with a differently shaped head, less excised behind, larger and more nearly circular eyes and longer antennæ.

Pseudolasius bucculentus, new species

Text Figure 56

WORKER MAJOR.—

Length 3.2 mm.

Head large, as broad as long, broader behind than in front, with convexly inflated sides and front and deeply and angularly excised posterior border, the posterior corners being somewhat conical. Mandibles apparently 5-toothed, folded under the clypeus, which is short and in the middle convex and obtusely carinate; its anterior border in the middle with a shallow excision. Eyes very small and indistinct, situated a little in front of the median transverse diameter of the head. Frontal groove rather distinct; frontal carinæ very short; frontal area transverse, triangular, not impressed. Antennæ rather slender, the scapes not reaching to the posterior corners of the head; first funicular joint as long as the two succeeding joints together; joints 2 to 7 of subequal length, all slightly longer than broad. Thorax robust, pronotum broad, in profile only feebly convex above, the mesonotum rising higher than the pronotum to its middle and then sloping and concave to the mesoëpinotal suture. Epinotum with distinct base and declivity, the former short, sloping upward but not reaching the height of the mesonotum, the declivity flat and gradually sloping backward, more than twice as long as the base. Petiole small, with sharp, compressed, very distinctly notched superior border. Gaster voluminous, subelliptical, its anterior segment flattened in front and overlying the petiole. Legs long and stout.

Whole body, including the mandibles, shining and very finely and uniformly punctate, except the mandibles, which are longitudinally striate.

Pilosity and pubescence yellow, the former short, very sparse, absent except about the mouth and on the thoracic dorsum and as a single row of hairs along the posterior border of each gastric segment. Pubescence short and delicate but very dense, more conspicuous on the head and gaster than on the thorax, very fine and short on the appendages, the latter without erect hairs as in *bufonum*.

Uniformly brownish yellow; mandibular teeth and eyes blackish.

WORKER MINOR.—

Length 2.2 to 2.5 mm.

Differing from the major in the shape of the head, which is distinctly longer than broad, as broad in front as behind, with less convex, subparallel sides and less deeply excised posterior border. Eyes extremely small, reduced to one or two ommatidia, pigmentless. Scapes extending a short distance beyond the posterior corners of the head. In other respects like the major worker.

MALE.—

Length 3 mm.

Closely resembling the male of *bufonum* but with the head broader than long and especially broader and more swollen behind. Body and wings much paler, brownish yellow, the posterior portion of the head dark brown. Wings opaque, grayish, with pale brown veins and pterostigma. The pilosity is also very different, the hairs being very few and confined to the mouth-parts and genital appendages.

Described from a single major worker, two minor workers, and a male taken at Medje (Lang and Chapin), without further data. This species is quite distinct in the peculiar shape of the head and mesonotum of the worker major, the strongly notched petiolar border and the very feebly developed pilosity.

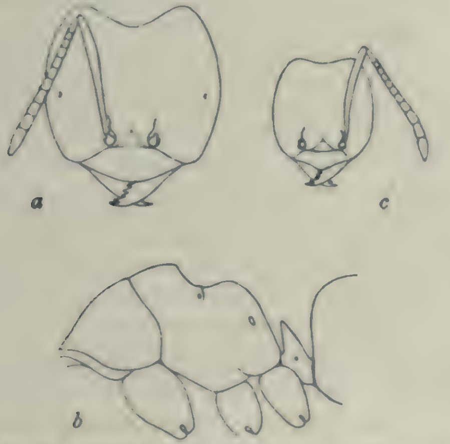


Fig. 56. *Pseudolasius bucculentus*, new species. *a*, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor.

Pseudolasius gowdeyi, new species

Text Figure 57

WORKER MAJOR.—

Length 2.5 mm.

Head as broad as long, subrectangular, as broad in front as behind, with straight sides and feebly but distinctly excised posterior border. Eyes absent. Mandibles with five acute teeth on their oblique apical borders, the median tooth small, the apical twice as long as the other three. Clypeus convex but not carinate, its anterior border nearly straight. Antennæ slender, the scapes extending about one-fifth their length beyond the posterior corners of the head; the second funicular joint not longer than broad, the succeeding joints slightly longer than broad. Thorax short and robust, the pro- and mesonotum forming together an evenly rounded convexity; mesopleuræ somewhat compressed; epinotum short, nearly horizontal, lower than the mesonotum, passing through a curve into the sloping, flat declivity. Petiolar scale narrowed above, its sides curved, its superior border rather blunt, truncated, entire. Gaster elliptical. Legs rather short.

Whole body smooth and shining, except the mandibles, which are opaque and very finely and densely striated. Integument of the body and appendages apparently microscopically but not densely punctate.

Hairs and pubescence white, the former sparse, conspicuous only on the clypeus, thorax, and gaster, the appendages being without erect hairs. Pubescence short, rather dense on the head and gaster, longer on the latter, slightly oblique on the scapes and legs.

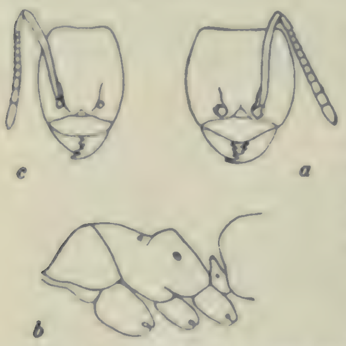


Fig. 57. *Pseudolasius gowdeyi*, new species. *a*, head of worker major; *b*, thorax and petiole of same in profile; *c* head of worker minor.

Pale yellow, the head and thorax a little darker, mandibular teeth dark brown.

Worker minor.—

Length 1.8 to 2 mm.

Differing from the major worker in its smaller head, which is elongate and with very feeble occipital excision. Antennal scapes reaching nearly one-fourth their length beyond the posterior corners of the head; joints 2 to 6 of the funiculus as broad as long.

Described from two major and sixteen minor workers taken by Mr. C. C. Gowdey at Entebbe, Uganda. They were found attending subterranean coccids (*Pseudococcus citri* Risso) about the roots of coffee.

This is readily distinguished from all the preceding species by its smaller size, paler color, the complete absence of eyes even in the major workers, the shape of the head and thorax, and the pilosity.

ŒCOPHYLLA F. Smith

Worker medium-sized, slender, slightly polymorphic. Head rather large, broader behind than in front, with rounded sides and posterior corners and semicircularly excised occipital border, very convex above. Eyes large, convex, broadly elliptical, situated in front of the middle of the head. Ocelli absent. Palpi very short, maxillary pair 5-jointed, labial pair 4-jointed. Mandibles long and large, triangular, with nearly straight lateral borders, a very long curved apical tooth and numerous short denticles along the straight apical border. Clypeus very large and convex, but not distinctly carinate, its anterior border entire or very feebly sinuate in the middle, depressed and projecting over the bases of the mandibles. Frontal area rather large, subtriangular; frontal carinæ moderately long, subparallel. Antennæ very long, 12-jointed, the scapes inserted some distance from the posterior corners of the clypeus, rather abruptly incrassated at their tips; the first funicular joint very long and slender, longer than the second and third together, joints 2 to 5 much shorter, subequal, slender, the remaining joints, except the last, shorter and distinctly thicker. Thorax long and narrow; pronotum longer than broad, evenly convex above, narrowed and colliform anteriorly; mesonotum anteriorly long and constricted, subcylindrical, suddenly broadened behind where it joins the small, short, unarmed epinotum, which is rounded and convex above and without distinct base and declivity. Petiole long and slender, much longer than broad, subcylindrical, with a very low rounded node near its posterior end, its ventral surface near the middle more or less convex, its posterior border on each side with a small rounded, projecting lamella, appearing like an acute tooth when the segment is viewed from above. Gaster short, broadly elliptical, its first segment suddenly contracted to the petiole, the tip rather pointed. Legs very long and slender; claws, pulvilli, and last tarsal joint enlarged. Gizzard with long slender sepals, which are not reflected at their anterior ends.

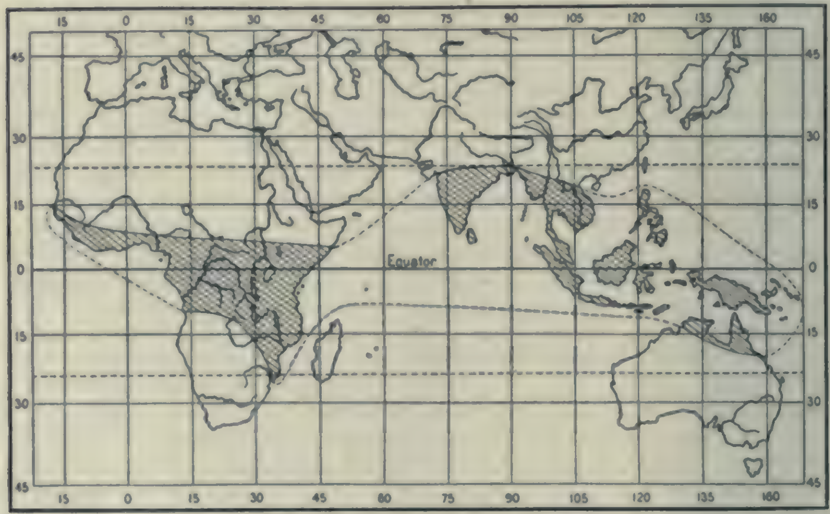
FEMALE much larger than the worker. Head broad, subtriangular; eyes not much larger than in the worker; ocelli well developed Thorax and gaster very broad and massive, flattened above; thorax nearly as broad as long, pronotum small and vertical, overhung by the large depressed mesonotum; epinotum nearly vertical. Petiole short and stout, broader than long, its node low and rounded, more or less impressed in the middle, obliquely truncated or concave behind. Gaster short, nearly as broad as long. Wings very long and ample, decidedly longer than the body, heavily veined, with a narrow closed radial, a large single cubital, and no discoidal cell.

MALE somewhat smaller than the largest workers. Head small, broader than long, with very prominent, hemispherical eyes and moderately large ocelli. Mandibles very small, spatulate, with a few minute denticles. Antennæ slender and rather short, 13-jointed; scapes elongate, their apical halves somewhat abruptly incrassated; first funicular joint clavate, enlarged at tip, slender at base; remaining joints much shorter, except the last, and slender. Thorax short and massive, the mesonotum broader than the head, very convex and gibbous in front where it overhangs the small mesonotum. Petiole and gaster similar to those in the worker, but the former more flattened above and without a node. Genital appendages very small, narrow, linear; legs long and slender, tarsal claws obsolete, but pulvilli well-developed. Wings ample, distinctly paler than in the female. Head, thorax and gaster much more pilose than in the worker and female.

PUPÆ not enclosed in cocoons.

This interesting genus is confined to the Old World tropics and ranges over the Indomalayan, Papuan, and Ethiopian Regions, but does not occur in Madagascar (Map 37). It comprises the famous and vicious "tree-ants," or "tailor ants," which make peculiar globular or elliptical nests of leaves on living trees. The leaves are spun together with films of white silk, which is supplied by the larvæ. Numerous observers, notably Holland and Green, Wroughton, Rothney, Dodd, Saville Kent, Doflein, Bugnion, the Sarasin Brothers, Jacobson, Kohl, and myself, have described the extraordinary manner in which the workers use the young larvæ as animated shuttles.

According to the majority of myrmecologists, the genus *Œcophylla* comprises only a single species, *smaragdina* (Fabricius), with several geographical races and varieties. A study of the materials that have been accumulating in my collection for the past twenty years, together with the fine series of specimens taken by Lang and Chapin in the Congo, has convinced me that there are really two distinct species: *Œ. smaragdina* (Fabricius) of the Indomalayan and Papuan Regions, with the varieties *selebensis* Emery, *gracilior* Forel, and *gracillima* Emery and the subspecies *subnitida* Emery and *virescens* (Fabricius); and *Œ. longinoda* (Latreille) of the Ethiopian Region, with the varieties *textor* Santschi, *rubriceps* Forel, *annectans*, new variety, and *fusca* Emery. Ern. André described a form *brevinodis*, from Sierra Leone, as a distinct species, and Stitz has recently cited it from Spanish Guinea, remarking that *longinoda* occurs on the coast, *brevinodis* in the hinterland, and that there are no transitions between the two. He implies also that *brevinodis* does not make silken nests like *longinoda*. The abundant Congo series from various nests shows, however, without the slightest doubt, that *brevinodis* is nothing but the worker minima of *longinoda* (see Fig. 58*c*), as Emery maintained as long ago as 1886, and the localities of the material before me show that this species is not confined to the west coastal region. It occurs also in East Africa, Santschi's variety *textor* being from Zanzibar. Several authors have cited the true *smaragdina* from East Africa. Unfortunately I have little material from that region and what I have is certainly *longinoda*, presumably belonging to *textor*, though this variety seems to me to be poorly characterized and possibly not distinct from



Map 37. Distribution of the genus *Œcophylla*.

the typical form of the species. I am unable to say, therefore, whether *Œ. smaragdina* actually occurs on the African continent.

According to Emery, *longinoda* is the most primitive of the existing forms of *Œcophylla*, because most closely allied to *Œ. sicula*, which he described from the Miocene amber of Sicily. In the Baltic amber I have recognized two species of the genus, *Œ. brischkei* Mayr and *brevinodis* Wheeler. As the latter name is preoccupied by *brevinodis* André, which was based, as I have shown, on the minima worker of *longinoda*, I suggest that the fossil species be called **crassinoda** (new name). In the shape of the petiole both of the Baltic amber forms, being of Lower Oligocene age and therefore older than *sicula*, are also more like *longinoda*, and especially its smaller workers, than the Oriental *smaragdina*.

Œcophylla longinoda (Latreille)

Plate XX, Figures 1 and 2; Text Figures 58 and 59

Faradje, ☿, ♀, ♂; Malela, ☿; San Antonio, ☿ (Lang and Chapin); Katala, ☿; Leopoldville, ☿ (J. Bequaert).

The following differences between this species and *smaragdina* may be noted. In the worker the polymorphism is greater, for not only do the individuals of the same colony show a greater range in size (from 3 to 9 mm.) but the minimæ differ more from the mediæ and maximæ in the shape of the thorax and petiole. The head of the worker *longinoda* is distinctly more triangular than that of *smaragdina*, being broader behind, with less convex sides; the eyes are distinctly larger, the mandibles shorter, the clypeus more nearly subcarinate behind, its anterior border sometimes feebly and sinuately emarginate in the middle, the pronotum less convex, the petiole decidedly stouter, more thickened behind, with the stigmata much less prominent when the segment is viewed from above and its ventral surface much more convex anteriorly on the ventral side, when viewed in profile. The sculpture, pilosity, and color are very similar in the two species, but in *longinoda* the integument is more decidedly opaque, the mandibles are somewhat more coarsely striated, always darker, being concolorous with the posterior portion of the head, at least in the large workers and especially in the dark varieties. The transverse furrow on the second and succeeding gastric segments just behind the anterior border is more pronounced in *longinoda*.

The female of this species measures 12 to 14 mm. (wings 16 mm.) and is, therefore, distinctly smaller than the corresponding sex of *smaragdina*, which measures 15 to 17 mm. (wings 18 to 19 mm.). The body of the African species is much more opaque throughout, the wing-veins more heavily bordered with dark brown, and the transverse bands at the bases of the second and following gastric segments are broader, darker, and more sharply marked off from the remainder of the segments. The green portions of the typical *longinoda* female are slightly more olivaceous and less pea-green, and the basal bands of the gaster are more exposed and brownish; the appendages are more brownish.

The male *longinoda* is scarcely smaller than that of *smaragdina* and measures 6 to 6.5 mm., but the head, thorax, and petiole are darker and more blackish; the head is decidedly broader, especially behind, the mandibles, petiole, antennal scapes, and wings are decidedly shorter and the integument is less shining.

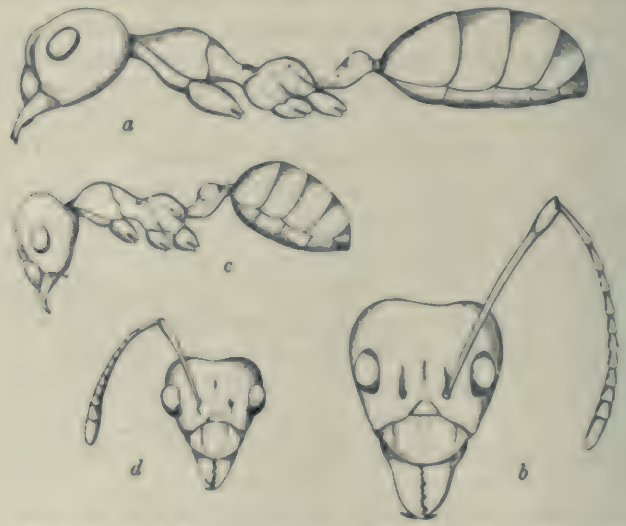


Fig. 58. *Œcophylla longinoda* (Latreille). *a*, body of worker major in profile; *b*, head of same; *c*, body of worker minima in profile; *d*, head of same.

The workers of the various subspecies and varieties of the two species may be separated by means of the following key.

1. Petiole very slender, its stigmata seen from above very prominent, its ventral surface nearly straight or very feebly convex in profile (*smaragdina*) . . . . 2.
Petiole stouter and higher, its stigmata seen from above not prominent, its ventral surface strongly convex in profile (*longinoda*) . . . . 7.
2. Body ferruginous or testaceous . . . . 3.
Gaster and sometimes the head pea-green, head more rounded and less truncated behind; size smaller, petiole somewhat shorter (Queensland, New Guinea, Islands Aru and Key) . . . . subspecies *virescens* (Fabricius).

3. Integument opaque or subopaque. 4.
   Integument more or less distinctly shining. . . . . 5.
4. Color ferruginous (India, Ceylon, Cochin China, Indonesia).
   smaragdina (typical).
   Smaller and more testaceous, mesonotum and petiole a little narrower (Java).
   variety *gracilior* Forel.
5. Large forms, integument slightly shining (Papua, Philippines, Melanesia).
   subspecies *subnitida* Emery.
   Smaller forms, integument more shining . . . . 6.
6. Body very shining and slender, color testaceous, head rather elongate (Island of Batjan). . . . . variety *gracillima* Emery.
   Less shining and less slender, head shorter (Celebes).
   variety *selebensis* Emery.
7. Ferruginous or testaceous throughout . . . . 8.
   Brown or black. . . . . 9.
8. Color ferruginous (West Africa) . . . . *longinoda* (typical).
   Color paler, more testaceous, petiole shorter, head slightly broader, apical tooth of mandibles shorter (Zanzibar). . . . . variety *textor* (Santschi).
9. At least the thorax and mandibles black. . . . . 10.
   Body rather uniformly brown (Belgian Congo). variety *annectens*, new variety.
10. Head dull red, gaster often brownish (Belgian Congo) . . variety *rubriceps* (Forel).
    Head and gaster black or dark brown (Belgian Congo, Nigeria, Liberia, Cameroon, Spanish Guinea) . . . . variety *fusca* (Emery).

(*E. fusca* was originally described by Emery as an independent species, but Forel reduced it to subspecific rank on finding the variety *rubriceps*, which shows some color variation in the direction of the typical *longinoda*. The discovery of another variety, *annectens* described below, connecting *rubriceps* and *longinoda* is additional evidence that *fusca* cannot be maintained as a species. In my opinion it is merely an extreme melanic variety, for I am unable to detect in it any morphological characters of even subspecific value. All of the varieties of *longinoda* are equally polymorphic in the worker caste and the smallest individuals all agree with the description of André's *brevinodis*, except in color.

The ethological observations of Chun[1] and Father Kohl[2] refer to this species.

Mr. Lang's photographs reproduced on Pl. XX, figs. 1 and 2, show two of the nests of the typical *longinoda* from Malela, consisting of the leaflets of a bush skillfully folded and united with the white silk spun by the young larvæ. He found that the nests of *longinoda* and its varieties are most often constructed on bushes and are sometimes only a few feet

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[1] 1903, 'Aus den Tiefen des Weltmeeres, II, p. 129

[2] 1906, 'Zur Biologie der spinnenden Ameisen,' Natur und Offenbarung, LII, pp. 166–169.

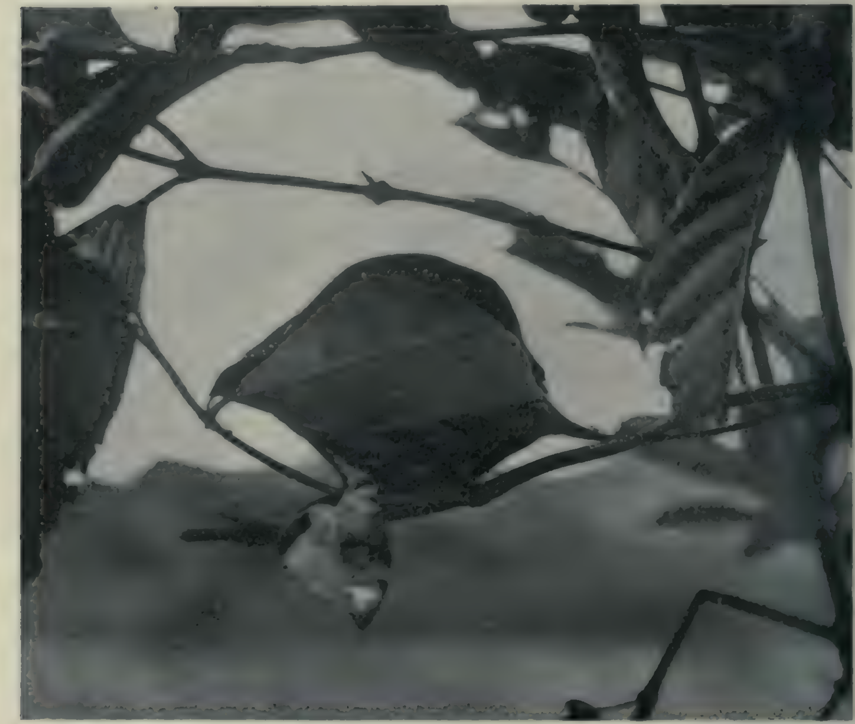


Fig. 59. Nest of *Œcophylla longinoda* (Latreille) at Avakubi, October 27, 1909. This nest, 16 cm. long, was placed about four feet from the ground in one of the coffee trees of a deserted plantation. Photograph by H. Lang

from the ground. Text Fig. 59 shows a nest of this ant placed in a coffee tree at Avakubi. The habits seem to be the same in all essential particulars as those of *smaragdina*.

Œcophylla longinoda variety **annectens,** new variety

Worker very similar to the typical form but brown instead of ferruginous, the gaster sometimes slightly darker than the remainder of the body. Mandibles, except in the small workers, darker brown than the front, cheeks, and clypeus. Incrassated tips of antennal scapes with a dark brown spot; funiculi, knees, tarsi, and tips of tibiæ pale yellow; pulvilli black.

Female brown, instead of green and brown like the typical *longinoda*, with darker brown markings on the thorax. Second and following gastric segments with the basal bands velvety black, so that the gaster is distinctly fasciate. Funiculi, tips of scapes, tibiæ, tarsi, and vertex paler, more reddish brown. Wings slightly darker than in the typical form, with deeper brown margins to the veins.

Male darker brown than the worker. Mandibles, antennæ, tarsi, and articulations of legs brownish yellow; last tarsal joint black. Wings distinctly paler than in the female.

Described from long series of specimens from the following places: Avakubi (type locality), ☿, ♀, ♂; Stanleyville, ☿; Niangara, ☿ (Lang and Chapin); Malela, ☿ (J. Bequaert).

Œcophylla longinoda variety **rubriceps** (Forel)

Worker black or dark brown, the head dull, blood red, often darker laterally and posteriorly, tips of antennal funiculi and second to fourth tarsal joints pale brownish yellow. Gaster in specimens from some colonies brown, the posterior margins of the segments paler.

Female dark brown, almost black, the gaster very little paler, the bands at the bases of the segments velvety black; tarsi and tips of funiculi pale brown. Wings even darker than in the variety *annectens*.

Male black; mandibles, legs, and funiculi piceous; wings paler than in the female but darker than in the male *annectens*.

Described from many specimens from two colonies taken at Stanleyville (Lang and Chapin). The workers of one colony agree closely with Forel's description of the types from the Belgian Congo in having the gaster nearly or quite concolorous with the thorax, and some of the larger specimens are scarcely distinguishable from the variety *fusca*; the workers of the other colony have the gaster rather pale brown and, therefore, connect the variety with *annectens*, which seems to be a more stable form than *rubriceps*.

Œcophylla longinoda variety **fusca** (Emery)

Worker differing from *rubriceps* only in having the head entirely black or dark brown, though sometimes with a reddish tinge above. Mandibles black, with dark brown teeth. Large workers have the clypeal border very feebly sinuate in the middle and the surface just behind it with a faint longitudinal impression. The smallest workers are a little paler, with paler mandibles, but in the structure of the thorax and petiole precisely like the corresponding phase of the other forms of the species.

Female like that of *rubriceps*, but perhaps a shade darker.

Male indistinguishable from the male of *rubriceps*, except that the erect white hairs on the dorsal surface of the head, thorax, and gaster are distinctly longer and more abundant.

Redescribed from specimens taken at Stanleyville and Garamba (Lang and Chapin). There is also a worker of this variety from Monrovia, Liberia, (J. Morris) in my collection.

CAMPONOTUS Mayr

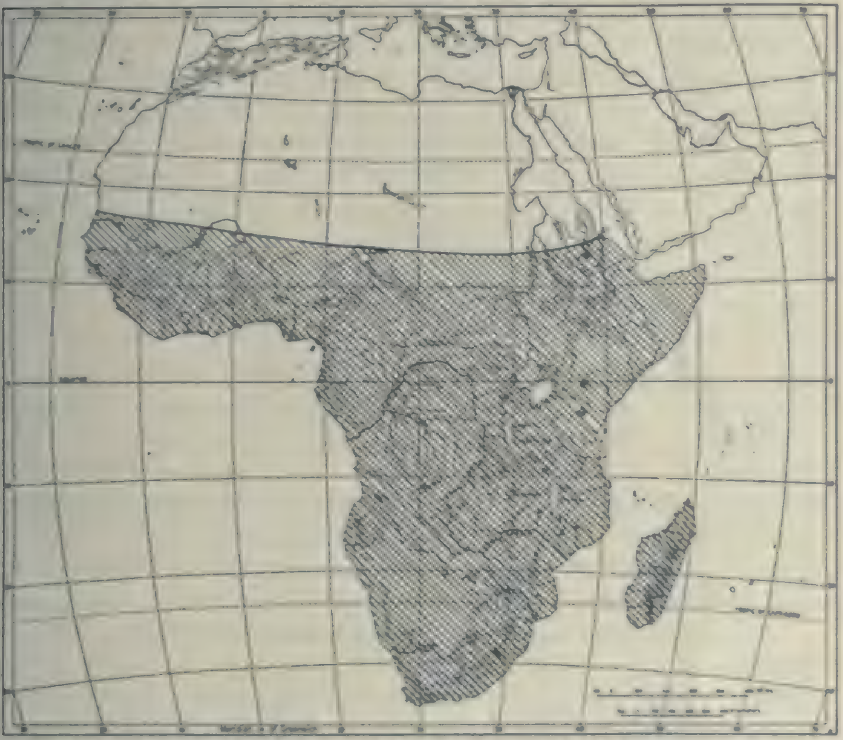
WORKER medium-sized to very large, polymorphic, rarely dimorphic, the worker maxima having a large, broad head, the minima a much smaller head and more slender body, the media being intermediate in structure. Head differing considerably in form in different species, usually broad and more or less excised behind, narrower in front, very convex above and flattened beneath. Mandibles powerful, short, triangular, with coarse teeth on their broad apical borders; external border and upper surface convex in large individuals. Palpi moderately long, the maxillary pair 6-, the labial pair 4-jointed. Clypeus large, trapezoidal or subrectangular, usually carinate or subcarinate, often divided into a large, median, subhexagonal and two small, triangular, lateral divisions, which do not reach the lateral border of the cheeks, the anterior border entire or emarginate, often excised on each side, with a broad, more or less projecting median lobe. Frontal area small, triangular or lozenge-shaped; frontal groove distinct; frontal carinæ long, prominent, marginate, and sinuate or S-shaped, rising from the posterior border of the clypeus. Eyes moderately large, broadly elliptical, not very prominent, situated behind the middle of the head; ocelli absent, the anterior ocellus sometimes indicated. Antennæ 12-jointed; scapes sometimes thickened distally, inserted some distance behind the posterior border of the clypeus; funiculi long, filiform, not enlarged at their tips, all the joints longer than broad. Thorax differing greatly in shape in the various species, typically broadly and more or less evenly arcuate in profile, broad in front, laterally compressed behind, the epinotum usually simple and unarmed. Rarely the mesonotum is impressed or sellate. Petiole surmounted by an erect scale, the upper border of which may be blunt or anteroposteriorly compressed, entire, subacuminate or more or less emarginate. Gaster rather large, broadly elliptical, its first segment forming less than half its surface. Legs long and well developed. Gizzard with a long slender calyx, the sepals of which are not reflected at their anterior ends.

FEMALE larger than the worker maxima but usually with smaller head. The latter and the petiole much as in the worker. Ocelli present. Thorax elongate elliptical; pronotum short, its posterior margin arched, its posterior angles reaching back to the insertions of the wings, mesonotum and scutellum long, convex; metanotum depressed below the scutellum. Gaster elongate elliptical, massive. Wings long and ample, the anterior pair with a radial, one cubital, and no discoidal cell.

MALE small and slender; head small, with very prominent eyes and ocelli. Mandibles small and narrow. Antennæ 13-jointed, slender, scapes long. Petiolar node thick and blunt; gaster elongate, with small slender genital appendages. Legs very slender. Wing venation as in the female.

PUPÆ nearly always enclosed in cocoons.

This huge cosmopolitan genus, comprising more than 1000 described forms, has become so unmanageable that Forel and Emery have recently split it up into some thirty-six subgenera. The frequent occurrence of species of *Camponotus* in all countries, except Great Britain and New Zealand, and the extraordinary variability of many of the species in response to slight differences of environment make the genus one of considerable interest to the student of geographical distribution. In the Ethiopian Region, it is represented by numerous species assignable to no less than eleven of the thirty-six subgenera recognized by Emery and myself, namely, *Myrmoturba*, *Dinomyrmex* (Map 41), *Myrmosericus*, *Myrmothrix* (one species, probably introduced), *Orthonotomyrmex*, *Myrmotrema* (Map 38), *Myrmopiromis*, *Myrmorhachis*, *Myrmopsamma*, *Myrmamblys*, and *Colobopsis*, and species of six others, *Camponotus*, *sensu stricto*, *Myrmosaulus*, *Myrmosaga*, *Mayria*, *Myrmonesites*, and *Myrmopytia*, occur in the Malagasy Region. A few of these subgenera, *Myrmopsamma* and *Myrmopiromis*, are peculiarly African, while others, *Myrmosaga*, *Mayria*, *Myrmonesites*, and *Myrmopytia*, are only found in Madagascar. The development of the subgenus *Myrmoturba* and especially of the species *maculatus* (Fabricius), the typical form of which is West African, is extraordinary, as will be seen by consulting the catalogue (Part VIII). *C.* (*Myrmoturba*) *maculatus* (Map 39) and two other species, *C.* (*Myrmosericus*) *rufoglaucus* (Map 42) and *C.* (*Orthonotomyrmex*) *sericeus* (Map 43), have a singular distribution. Forms of *maculatus*



Map 38. Distribution of *Myrmotrema*, a subgenus of *Camponotus* of the Ethiopian and Malagasy Regions. According to Emery (1920) one species occurs in India.

occur in all the continents; *rufoglaucus*, with many varieties, ranges from southern China across India and equatorial and South Africa to the Gulf of Guinea; and *sericeus* occupies a similar range, though showing little tendency to produce subspecies and varieties.

The species of *Camponotus* often form very populous colonies and exhibit a great diversity of nesting habits. Many live in the ground, either under stones or in crater nests, others under bark, in dead wood, hollow twigs, and galls, and a few construct carton nests or employ their larvæ, after the manner of *Œcophylla*, in spinning together particles of vegetable detritus with silk (*C. senex* and *formiciformis*). The food of the various species consists of miscellaneous insects, the excreta of aphids (honeydew), and nectar. Many of the smaller forms are stolid, apathetic, or timid, but the maxima workers of the large species belonging to the subgenera *Dinomyrmex*, *Myrmoturba*, *Myrmothrix*, and *Myrmopiromis* are very pugnacious and capable of inflicting painful wounds with their powerful mandibles.

Camponotus (**Myrmoturba**) **maculatus** (Fabricius)

Medje, ♃, ☿, ♀; Yakuluku, ♃, ☿; Garamba, ♃, ☿; Vankerckhovenville, ☿; Faradje, ♂ (Lang and Chapin). Six of the workers from Garamba, all minors, were taken from the stomach of a toad (*Bufo regularis*). The major workers agree perfectly with Donisthorpe's redescription[1] of the Fabrician type of this ant in the Banks Collection, presumably from Sierra Leone, except that they have a few short, erect hairs on the gular surface of the head.

The distribution of *C. maculatus* and its various forms is shown on Map 39.

Camponotus (**Myrmoturba**) **maculatus** subspecies **guttatus** Emery

I refer fourteen minor workers from Zambi (Lang, Chapin, and J. Bequaert) to this pale subspecies. The specimens were taken "only at night-fall, visiting the tables in the camp. They are shy and fast runners."

Camponotus (**Myrmoturba**) **maculatus** subspecies **melanocnemis** (Santschi)

Faradje, ♃, ☿; Yakuluku, ♀ (Lang and Chapin). Numerous specimens from several colonies.

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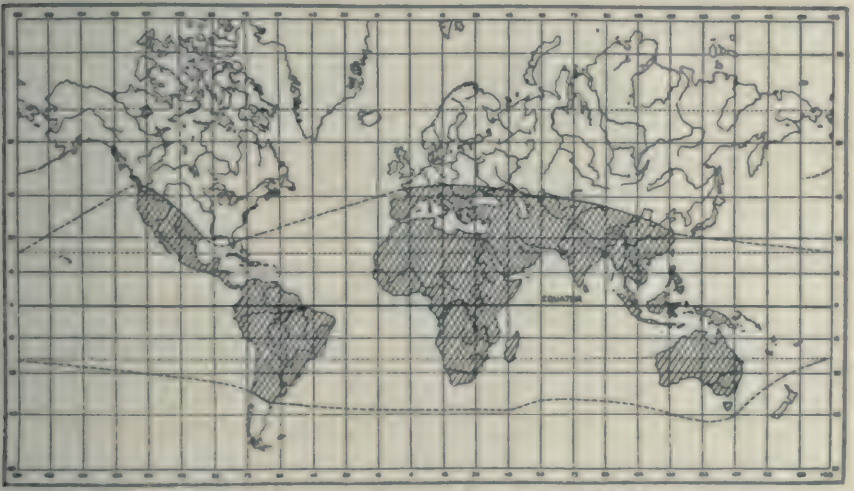
[1] 1915, Ent. Record, XXVII, p. 221.

Camponotus (Myrmoturba) maculatus subspecies **congolensis** Emery

Yakuluku, ♃, ☿; Faradje, ♃, ☿; Medje, ☿; Niangara, ☿, ♀; Garamba, ♃, ☿, ♀ (Lang and Chapin). Numerous specimens. A major and two minor workers from Faradje are from the stomach of a frog (*Rana occipitalis*), one of the major workers from Garamba from the stomach of a toad (*Bufo regularis*).



Map 39. Distribution of *Camponotus (Myrmoturba) maculatus* (Fabricius) and its forms.

Camponotus (Myrmoturba) maculatus subspecies **miserabilis** Santschi variety **pessimus**, new variety

The major worker measures only 6 to 6.5 mm., the minor 5 to 5.5 mm. Both agree closely with Santschi's description and figure of *miserabilis*, except in their considerably smaller size. The head of the major is distinctly narrower anteriorly, the cheeks being less convex and the frontal carinæ are less approximated. Sculpture, pilosity, and color very much as in *miserabilis*.

Four major and five minor workers from Yakuluku (Lang and Chapin), without further data.

Camponotus (Myrmoturba) maculatus subspecies **solon** Forel

Bafwabaka, ♃ ☿; Niangara, ♃; Akenge, ♃; Medje, ♃ (Lang and Chapin). All the specimens from the three former localities, twenty in number, were taken from the stomachs of toads (*Bufo regularis*, *funereus*, and *polycercus*), the single specimen from Medje from the stomach of a frog (*Rana albolabris*).

Camponotus (**Myrmoturba**) **maculatus** subspecies **solon** variety **jugurtha**, new variety

WORKER MAXIMA. Differing from the typical *solon* in its much paler color, the antennæ, head, and thorax being red; the mandibles, front, and a streak down the middle of the clypeus castaneous; the posterior corners of the head, the legs including the coxæ, the petiole, and the three basal gastric segments brownish yellow; the tip of the gaster more brownish. The mandibles are very finely striated and the petiolar scale is much compressed and prolonged above as in the typical *solon* and not blunt as in *brutus*. In the feebler punctuation of the head this variety is also like the typical *solon*.

A single specimen from Batama (Lang and Chapin), without further data.

Camponotus (**Myrmoturba**) **maculatus** subspecies **brutus** (Forel)

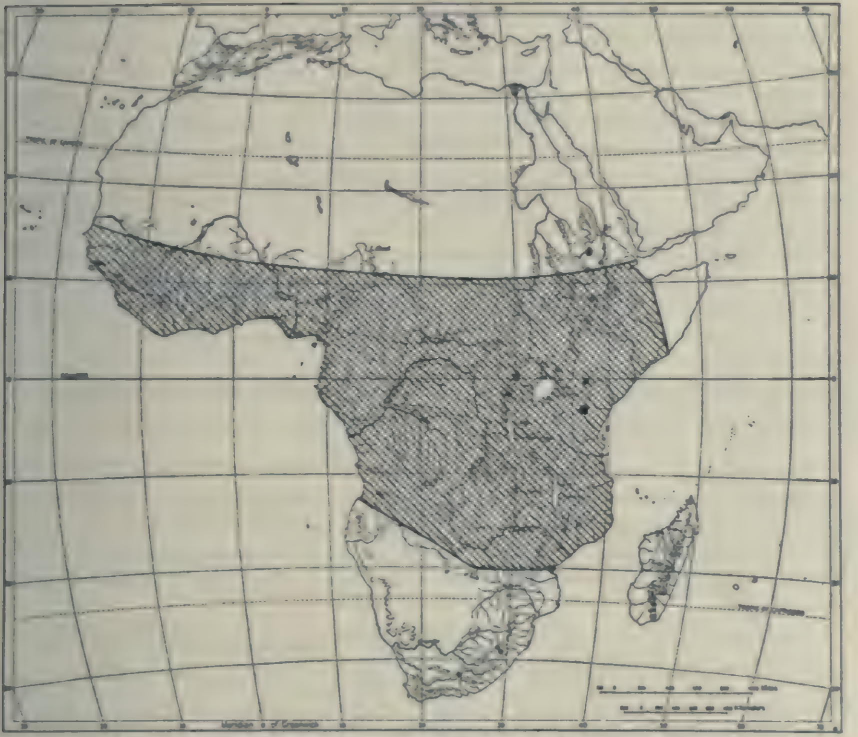
Avakubi, ♃, ☿; Medje, ♃, ☿; Faradje, ♃, ☿, ♀; Bafwasende, ♃, ☿; Stanleyville, ♃, ☿, ♀; Batama, ♀; Lukolela, ☿; Malela, ♃, ☿; Isangi, ♃, ☿; Nouvelle Anvers, ♃, ☿; Zambi, ☿; Poko, ♃; Akenge, ♃, ☿; Niangara, ♃, ☿ (Lang and Chapin); Malela, ♃, ☿ (J. Bequaert). The workers from Akenge and Niangara, ten in number, are from the stomachs of toads (*Bufo funereus*, *polycercus*, and *regularis*). To judge from the many series of specimens, this large red ant must be very common in the Congo. Its native name, according to Mr. Lang, is "maola." It nests in rotten wood. The specimens from Nouvelle Anvers were found nesting in an old oil palm trunk.

Camponotus (**Myrmoturba**) **maculatus** subspecies **brutus** variety **lycurgus** Emery

Two major and four minor workers, taken at Leopoldville (Lang and Chapin), may be referred to this variety, which has the dark head and thorax of the typical subspecies *solon*.

Camponotus (**Myrmoturba**) **acvapimensis** Mayr

Faradje, ♃, ☿; Garamba, ♃, ☿; Bolengi, near Coquilhatville, ♃, ☿; Stanleyville, ☿; Thysville, ☿; Vankerckhovenville, ♃, ☿; Niangara, ♃, ☿; Akenge, ♃, ☿ (Lang and Chapin); Zambi, ♃, ☿; Thysville, ☿ (J. Bequaert). Of the numerous specimens of this small black species, thirty from Garamba and Niangara are from the stomachs of toads (*Bufo regularis* and *funereus*). A single major worker from Faradje is from the stomach of a frog (*Rana occipitalis*). The specimens from Bolengi were found nesting in the trunk of an oil-palm; some of those from Faradje were captured while attending plant lice on the young leaves of orange trees. The distribution of this species is shown on Map 40.



Map 40. Distribution of *Camponotus (Myrmoturba) acrapimensis* Mayr.

Camponotus (**Myrmoturba**) **maguassa,** new species

MAJOR WORKER.—

Length 9 to 10 mm.

Head rather small, subrectangular, as long (1.3 mm. without the mandibles) as broad, a little narrower in front than behind, with straight posterior and very feebly convex lateral borders. Eyes rather large and convex, situated about their length from the posterior border when the head is seen from the front. Mandibles moderately convex, coarsely 6-toothed. Clypeus sharply carinate behind, rather deeply emarginate on each side of the median lobe, which is short, with straight border, distinctly dentate at the corners. Frontal area subtriangular, indistinct behind; frontal groove pronounced; frontal carinæ approximated anteriorly. Antennæ slender, the scapes straight, terete, not enlarged at the tips, reaching about two-fifths their length beyond the posterior border of the head. Pronotum flattened above, its sides distinctly marginate anteriorly; mesonotum evenly arched in profile; metanotum indistinct; epinotum with subequal base and declivity, both surfaces straight and sloping, meeting at a rounded obtuse angle. Petiole rather high, oval when seen from behind, in profile with flattened anterior and posterior surfaces, its superior border rather sharp and entire. Gaster and legs as usual, hind tibiæ nearly cylindrical, only very slightly compressed, without a row of bristles along their flexor surfaces.

Body subopaque, the petiole, gaster and legs more shining. Mandibles coarsely and sparsely punctate, their tips striated, their bases sharply shagreened. Head very densely, evenly and finely punctate, so that it appears granular; the clypeus, cheeks, front, and vertex also with large, scattered, irregular, piligerous punctures. Sculpture of the thorax like that of the head but finer, especially on the pleuræ; the dorsal surface with coarse, sparse, piligerous punctures. Gaster finely, sharply and transversely shagreened, with coarse, sparse, transverse piligerous punctures. These have minutely papillate anterior borders so that the coarse hairs seem to rise from small projections. Legs finely shagreened or coriaceous.

Hairs fulvous red, coarse, erect, rather abundant, long on the dorsal surface of the head, thorax, and gaster, somewhat shorter on the gula and petiolar border, still shorter but suberect on the cheeks, scapes and legs. Pleuræ, anterior and posterior surfaces of petiole hairless. Pubescence rather coarse, very sparse, visible on the cheeks and gaster.

Brownish black; funiculi, tips of scapes, legs, including the coxæ, petiole, and gaster rich castaneous, the legs and funiculi slightly paler.

Worker minor.—

Length 5 to 7.5 mm.

Differing from the major worker in the shape of the head, which is longer than broad, with straight, parallel sides and broadly convex posterior border. The eyes are more convex, the antennal scapes longer, extending somewhat more than half their length beyond the posterior corners of the head. The clypeal lobe has more rounded corners.

Described from numerous specimens from two colonies taken at Avakubi (Lang and Chapin). According to a note accompanying one lot, "these ants are said to be common in the forest in the decayed wood of large trees. Native name 'maguassa.'"

This species bears a striking resemblance to *C. festai* Emery from Asia Minor. The single worker major cotype of this insect in my collection lacks the head, so that in making comparisons of this part of the body I have to rely entirely on Emery's description. The head of the worker major of *festai* is evidently larger (3.5×3.5 mm.), more narrowed in front, with the posterior border slightly concave; the mandibles are 7-toothed, the scape is somewhat flattened, the declivity of the epinotum much shorter than the base, the petiole much broader above, with sharper border; the hind tibiæ are prismatic, with dorsal groove and their flexor border has a row of bristles; the hairs and pubescence are yellow, the latter much longer and more conspicuous on the gaster than in *maguassa*, and the hairs on the legs are distinctly longer; the head and gaster are black, the thorax, legs, and petiole deep brownish red.

Camponotus (**Dinomyrmex**) **pompeius** Forel subspecies **cassius,** new subspecies

Text Figures 60 and 61

WORKER MAXIMA.—Differing from the maxima of the typical *pompeius* in having the head distinctly smoother, more shining, and more superficially shagreened, the apical tooth of the mandibles much longer, the corners of the clypeal lobe much more acute, the superior border of the petiole somewhat more obtuse, the petiole and thorax brownish red, except the pronotum and dorsum of the mesonotum, which are dark brown. The thorax and coxæ are covered with much longer, denser, and more conspicuous yellowish pubescence than in typical *pompeius*.

WORKER MINIMA.—Very similar to the typical form but the thorax and legs paler, and the head and thorax with longer pubescence.

Described from a single maxima and seven minimæ from Yakuluku (Lang and Chapin). There is also a single mermithergate from Medje which I have figured (Fig. 61). It is 15 mm. long, the gaster measures 8 mm. and is enormously distended with nematode worms of the genus *Mermis*, which are visible through the thinner portions of the lateral and ventral integument. The head and thorax are like the corresponding parts of the minima or small media and there are no traces of ocelli. The petiole, however, has a somewhat more pointed node and therefore approaches slightly the condition in the female.

Four males from Medje and Faradje and three females from Stanleyville are probably referable to this or to one of the other forms of *pompeius*. They have the epinotum and legs more reddish than in the typical form. The wings of both females and males are slightly yellowish, with resin-colored veins and dark brown pterostigma.

Camponotus (**Dinomyrmex**) **pompeius** subspecies **marius** Emery

Medje, ♃, ☿; Akenge, ♃, ☿; Niapu, ☿ (Lang and Chapin). Two maxima and twenty-nine minima workers all from the stomachs of toads (*Bufo polycercus, funereus*, and *superciliaris*) and one small worker from Niapu from the stomach of a frog (*Xenopus tropicalis*) seem to belong to this form. Though from different localities, the two maximæ both have the head much smaller and narrower (without the mandibles, 4.5× 3.9 mm.) than in the typical *pompeius* or the preceding subspecies and agree very closely with Emery's description. He believed that the specimen he examined was not a maxima, but the two specimens from Medje and Akenge seem to indicate that the small narrow head may be characteristic of the largest worker of the subspecies. The petiolar scale in my specimens is also high and pointed, precisely as in Emery's figure, the scapes are long (4.5 mm.), and the coloration and sculpture agree with his description.

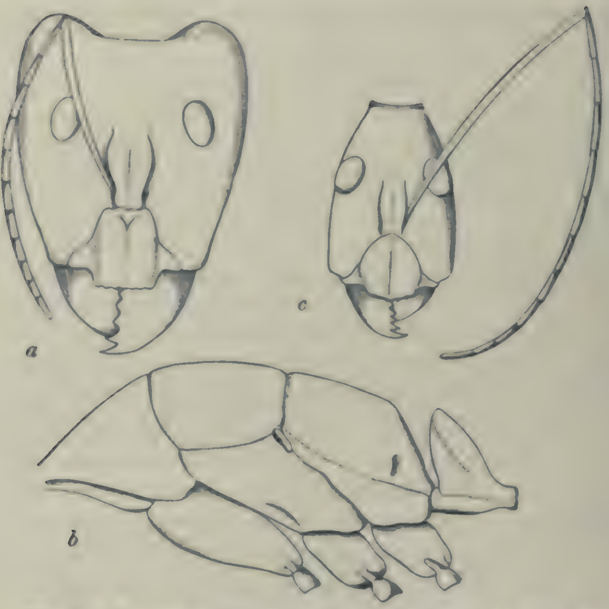


Fig. 60. *Camponotus (Dinomyrmex) pompeius* subspecies *cassius*, new subspecies. *a*, head of worker maxima; *b*, thorax and petiole of same in profile; *c*, head of worker minima.

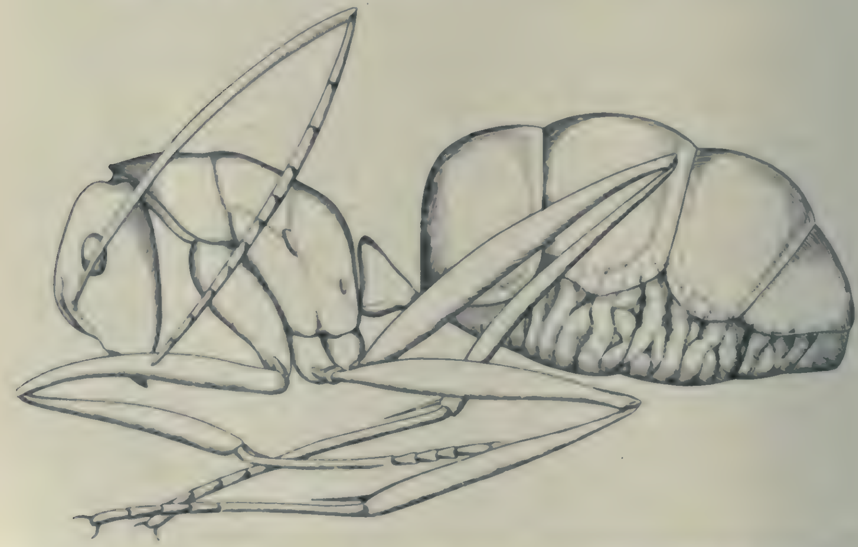


Fig. 61. *Camponotus (Dinomyrmex) pompeius* subspecies *cassius*, new subspecies. Mermithergate from Medje.

Camponotus (Dinomyrmex) langi, new species

Text Figure 62

WORKER MAXIMA.—

Length 12.5 to 14 mm.

Head unusually small, decidedly longer than broad (4.1 × 3 mm., without the mandibles), slightly narrower in front than behind, with broadly and not deeply excised posterior border and evenly, feebly convex sides. Eyes rather small and elongate, situated twice their length from the posterior border of the head. Mandibles rather small, convex, with 7 short teeth. Clypeus carinate, its anterior border emarginate on each side, the median lobe very short, its border coarsely crenulate, its corners obtuse. Frontal area small, subtriangular; frontal carinæ closely approximated, especially in front. Antennæ long (4.5 mm.) and slender, not enlarged distally, their bases distinctly flattened but not dilated, reaching nearly half their length beyond the posterior border of the head; funiculi long, filiform. Thorax low and narrow; metanotum distinct; epinotum long, its base nearly four times the length of the declivity, with a distinct, transverse impression in the middle. Petiole very low, subquadrate, and as broad as long when seen from above, in profile scarcely higher than long, obliquely truncated anteriorly and posteriorly, with very blunt superior border. Gaster long and narrow. Legs very long and thin; tibiæ triangular in cross-section, deeply channelled on all three surfaces, their flexor borders without row of bristles.

Mandibles, clypeus, legs, sides of thorax, and sides and venter of gaster somewhat shining, remainder of the body opaque. Mandibles more opaque at the base, where they are densely shagreened, smooth and coarsely punctate in the middle, coarsely striated towards the tip. Clypeus, head, and thorax very densely shagreened, the head more distinctly; clypeus, cheeks, and sides of head with small, scattered shallow, piligerous punctures. Gaster very finely and transversely shagreened, with very sparse piligerous punctures.

Hairs and pubescence golden yellow, very sparse and short, more abundant on the gula and top of the head, very short, sparse, and appressed on the appendages. Sides of head with short, sparse, stiff hairs. Pubescence very dilute, distinct on the gaster and all parts of the head, longest on the gula.

Head and gaster deep castaneous; mandibles dark red, with black borders; clypeus and adjacent portions of cheeks often reddish; tips and insertions of antennal scapes, palpi, thorax, petiole, trochanters, and femora dull brownish yellow; upper surface of pronotum, mesonotum, and base of epinotum dark brown with paler sutures; tibiæ, femora, and tarsi dark brown, the latter somewhat paler at their tips; posterior borders of gastric segments rather broadly yellowish and shining.

WORKER MINIMA.—

Length 11 to 12 mm.

Head very long (3.4 mm., without the mandibles) compared with its width (1.9 mm.), the portion in front of the eyes nearly as broad as long, a little broader in front, with straight sides; behind the eyes it narrows rapidly into a neck with concave sides, the occipital border being somewhat less than one-third of the anterior border. Eyes prominent, situated more than twice their length from the occipital border. Clypeus resembling that of the maxima. Antennæ longer, the scapes not flattened, straight, reaching fully three-fifths of their length beyond the occipital border. Thorax and petiole as in the maxima but lower, and the transverse impression on the base of the epinotum scarcely indicated.

Sculpture much finer, pilosity and pubescence even sparser than in the maxima. Color paler; clypeus, cheeks, funiculi, petiole, ventral portions of thorax, coxæ, and femora yellow; mandibles, scapes, posterior portion of head, tibiæ, and dorsal surface of thorax and gaster brown.

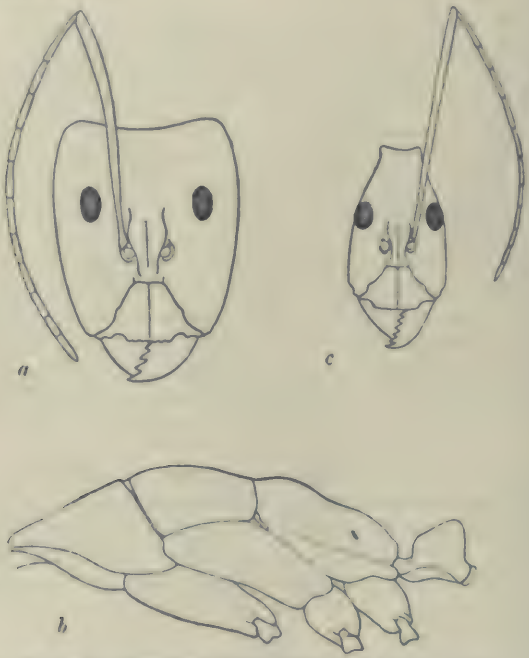


Fig. 62. *Camponotus (Dinomyrmex) langi*, new species. *a*, head of worker maxima; *b*, thorax and petiole of same in profile; *c*, head of worker minima.

Female (deälated).—

Length 21 mm.

Head large, slightly longer than broad, broader behind than in front, with straight sides and feebly and broadly excised posterior border. Mandibles more convex than in the maxima, clypeus very similar. Antennal scapes very slightly flattened at the base, extending nearly one-third their length beyond the posterior corners of the head. Thorax through the wing-insertions not broader than the head; mesonotum as long as broad. Petiole much higher than in the worker, nearly twice as high as long, elliptical from behind, its anterior and posterior surfaces convex, its border narrowed above and slightly notched in the middle, in profile rather acute.

Mandibles shining, coarsely punctate, their bases opaque. Head and body more shining than in the maxima, but similarly sculptured.

Pilosity like that of the maxima but the pubescence very long and abundant on the prosterna, fore coxæ, and lower portions of the metapleuræ; as long but sparser on the gula and posterior surfaces of the head; short on the scapes, but longer and oblique towards their tips. Tibiæ and tarsi with short, stiff, oblique hairs.

Head black; mandibles, sutures of thorax, upper portions of mesopleuræ, and pro- and mesonotum, scutellum, and gaster castaneous; remainder of thorax, petiole, middle and hind coxæ, and trochanters yellowish red. Legs castaneous, tips of tarsi paler.

MALE.—

Length 13 mm.

Head twice as long as broad, the portion in front of the eyes long, with subparallel, slightly concave cheeks, the posterior portion rapidly narrowed to the occiput, the sides and occipital border nearly straight. Eyes convex, at the middle of the sides of the head. Mandibles spatulate, bluntly pointed, edentate but with overlapping tips. Clypeus carinate, without an anterior lobe, its border broadly rounded. Antennæ very long and slender. Thorax and gaster long and narrow; epinotum elongate, evenly convex, sloping, without distinct base and declivity. Petiole much as in the worker minima. Legs very long.

Mandibles, head, thorax, and legs rather opaque; epinotum, petiole, and gaster shining, punctuation feeble and inconspicuous.

Hairs yellow, short, and sparse as in the worker minima.

Brownish yellow; head, mesonotum, scutellum, tibiæ, and tarsi brown; mandibles darker. Wings distinctly yellow, with yellowish brown veins and dark brown pterostigma.

Described from forty-one workers from Faradje (type locality), a female and worker minima from Garamba, and two males from Faradje (Lang and Chapin). The following note accompanies the specimens from Faradje: "These long-legged ants are very fond of sugar or anything sweet, such as fruits, etc. They are seldom seen during the daytime. The colony had made its nest between boxes that were piled up on the verandah of a house, and the ants were assembled in a hollow space about half an inch wide. A few fibrous particles of detritus were used in the construction of the nest." There are no data accompanying the two specimens from Garamba, so that I am not certain that the female is cospecific with the worker.

C. langi is very peculiar in the small, narrow head of the maxima and the long neck-like occipital region of the minima. There can be no doubt that what I have described as the maxima is really the largest worker form. Fifteen specimens of the series all agree in the shape and size of the head as represented in the figure; the remaining specimens are all minimæ. Mediæ, apparently, do not exist.

Camponotus (Dinomyrmex) cæsar Forel

A single imperfect worker minima from the stomach of a frog (*Rana occipitalis*) taken at Faradje (Lang and Chapin) seems to belong to this light-colored species.

Camponotus (Dinomyrmex) cæsar subspecies **imperator** Emery

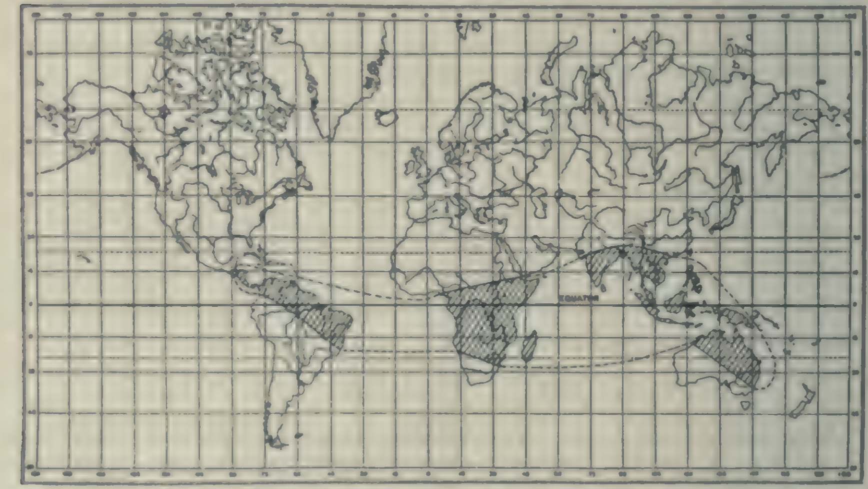
A single media from Isangi (Lang and Chapin), without further data.

Camponotus (Dinomyrmex) massinissa, new species

FEMALE.—

Length nearly 21 mm.

Head as broad as long (4.5 mm., without the mandibles), subrectangular, slightly broader behind than in front, with straight sides, feebly but broadly concave posterior border, and rather acute posterior corners. Mandibles large and convex, with 6 flattened, acuminate teeth, the apical tooth very long and broad at the base. Clypeus carinate only at the base, its anterior border emarginate on each side, the median lobe indistinct, somewhat crenate, without pronounced corners, with a small notch in the middle. Frontal area small, subtriangular, impressed. Frontal carinæ closely approximated. Antennæ long; scapes measuring 6.2 mm., extending half their length beyond the posterior corners of the head, not flattened at the base nor enlarged distally. Thorax robust, through the wing-insertions broader than the head. Mesonotum broader than long, with a narrow, shining, median, longitudinal groove on its anterior half. Epinotum sloping, evenly convex. Petiole higher than long, rather pointed above, its anterior surface made of two subequal planes which meet at a very blunt obtuse angle when seen in profile; the posterior surface flat, the superior border blunt. Hind tibiæ and metatarsi distinctly flattened and channelled, the flexor border of the former with a row of strong bristles, except on their basal fourth.

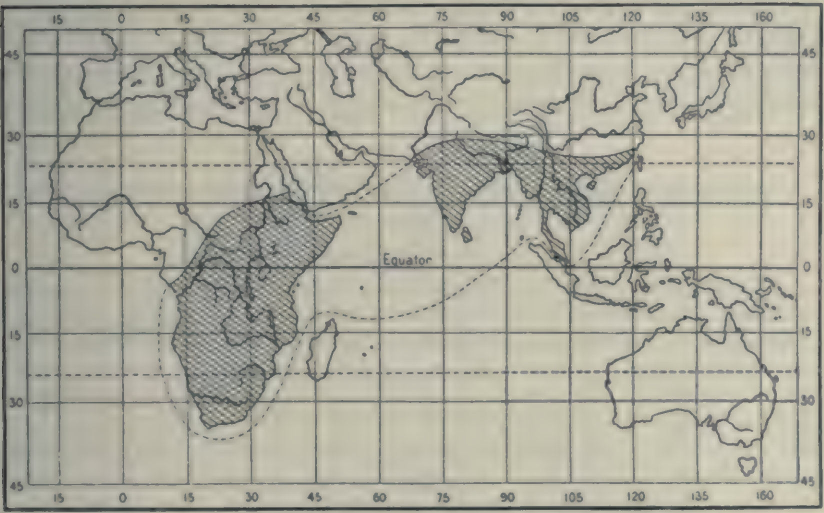


Map 41. Distribution of the subgenus *Dinomyrmex* of *Camponotus*.

Mandibles shining, coarsely punctate, striate near their apical borders, opaque, finely shagreened and less coarsely punctate at the base. Head and clypeus nearly opaque, densely and finely punctate, with coarser, sparse, piligerous punctures over the whole surface. Thorax and petiole with similar sculpture, but the piligerous punctures less pronounced. Gaster more shining, densely, coarsely and transversely shagreened, with coarse, scattered, transverse, piligerous punctures. Antennal scapes and legs shining, rather strongly and unevenly punctate.

Hairs fulvous, coarse, erect or suberect, long and abundant, especially on the head, gula, dorsal portion of the pronotum, mesonotum, epinotum, and fore coxæ. Antennal scapes also with long erect hairs; those on the tibiæ stiffer, much shorte and more oblique.

Black; mandibles except their bases and teeth, deep red; insertions of antennæ, funiculi beyond the tip of the first joint, thoracic articulations, trochanters, and tips of coxæ yellowish; gaster and legs castaneous. Wings heavily infuscated, blackish, with dark brown veins.



Map 42. Distribution of *Camponotus* (*Myrmosericus*) *rufoglaucus* (Jerdon).

A single specimen from Medje (Lang and Chapin), without further data.

This female is so easily recognized and so peculiar in its characters that I do not hesitate to describe it as new. It certainly does not belong to any of the workers in the collection and I am unable to regard it as the female of any of the Ethiopian species of *Dinomyrmex* that have been described from workers only.

Camponotus (Dinomyrmex) wellmani Forel variety **rufipartis** Forel

Stanleyville, ☿, ♂; Niangara, ☿; Faradje, ☿; Ngayu, ☿ (Lang and Chapin). The specimens agree very closely with Forel's description. Two workers from Ngayu were taken from the stomachs of toads (*Bufo superciliaris* and *funereus*) and one from Faradje from the stomach of a frog (*Rana occipitalis*).

Camponotus (**Myrmosericus**) **rufoglaucus** (Jerdon) subspecies **cinctellus** (Gerstæcker)

Five workers from Zambi (J. Bequaert).

The distribution of *C. rufoglaucus* and its various forms is shown on Map 42.

Camponotus (**Myrmosericus**) **rufoglaucus** subspecies **cinctellus** variety **rufigenis** Forel

Faradje, ☿; Niangara, ♀; Garamba, ☿; Stanleyville, ☿; Medje, ☿; Poko, ☿; Akenge, ☿ (Lang and Chapin). Six of the workers from Garamba are from the stomach of a *Bufo regularis* and a single worker from Akenge is from the stomach of a *B. funereus*. The specimens from Faradje were taken while they were attending plant-lice on young orange trees.

Camponotus (**Myrmosericus**) **rufoglaucus** subspecies **syphax,** new subspecies

Plate XXII, Figure 1

Worker very similar to the subspecies *zulu* Emery from Natal and quite as large, the largest specimens measuring fully 9 mm., but not more slender than other forms of the species. The scapes and tibiæ are distinctly compressed, the former as in *C. eugeniæ* Forel, but not so broad. Epinotum evenly arcuate in profile, without distinct base and declivity. Pubescence dull yellowish, not very long, slightly golden on the gaster of large individuals, only feebly converging at the mid-dorsal line on the posterior portions of the second and third segments. Color brownish black, the legs a little paler, the funiculi, cheeks, clypeus, mandibles, and tarsi castaneous. Gastric segments with very narrow, dull-yellowish posterior margins.

Numerous specimens from Zambi (type locality) and Boma (Lang, Chapin, and J. Bequaert).

The Zambi specimens are from three colonies, two of which bear the following notes. "Ants forming numerous small craters in the white sand (Pl. XXII, fig. 1). Only a few individuals were seen outside the nest before noon. The nest extended to a depth of 50 cm. below the surface." "Nest in the rotten base of a *Hyphæne*. No larvæ nor pupæ could be seen, though there were certainly as many as 1000 workers in the colony. The nest was loosely arranged in the soft, decomposing mass." Bequaert says of the specimens from Boma that they "run very swiftly and were nesting in the road."

Workers of this ant were sent to Prof. Emery, who compared them with his cotypes of the subspecies *zulu*. He pronounced them to belong to a new subspecies "with the pubescence on the gaster much more parallel and less sinuous."

Camponotus (Myrmosericus) rufoglaucus subspecies **flavomarginatus** (Mayr)

Akenge, ☿; Vankerckhovenville, ☿; Garamba, ☿; Faradje, ☿ (Lang and Chapin); Thysville, ☿ (J. Bequaert). A small number of specimens from each locality, without further data.

Camponotus (Orthonotomyrmex) vividus (F. Smith)

Plate XXI, Figures 1 and 2; Text Figure 63

Numerous workers of this shining black ant taken at Malela (Lang, Chapin, and J. Bequaert) and a single deälated female from Lukolela (Lang and Chapin). At Malela, the ants had occupied the large nest of an arboreal termite(Pl. XXI, figs. 1 and 2). "This consisted of strong, woody carton and was built around the stem of a sapling, which grew in a mangrove swamp among raphia palms. When the nest was disturbed the worker ants swarmed out and covered the nest in great numbers and then ran up on our bodies and attacked us furiously. Only after we had cut the nest open did we notice that it had been originally built by termites. Some dead specimens of these were found in one corner. As shown in the photograph, the ants themselves had excavated the strong carton, making more spacious and more irregular cells. There were several large and many small entrances on the surface of the nest."

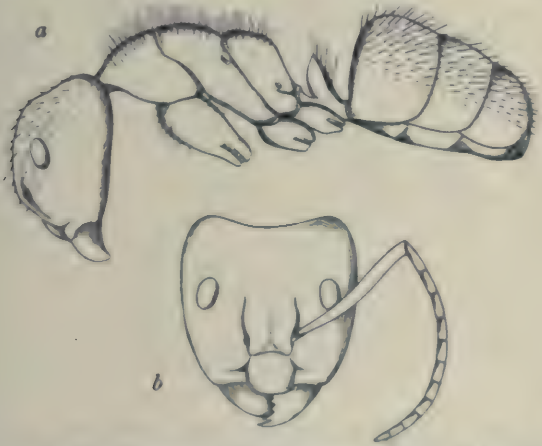


Fig. 63. *Camponotus (Orthonotomyrmex) vividus* (F. Smith). Worker major. *a*, body in profile; *b*, head, dorsal view.

Camponotus (Orthonotomyrmex) vividus variety **semidepilis,** new variety

Worker.—Exactly like the typical form, except that the erect hairs on the dorsal surface of the head and body are distinctly paler and only about half as numerous. The pubescence, too, is more dilute and shorter, especially on the gaster.

Described from numerous workers from Medje (type locality) and Leopoldville (Lang and Chapin). The following note relates to the specimens from the former locality: "These ants were taken out of their nest in the rather rotten portions of a tree. Their galleries were often large enough to admit one's finger. The workers, when disturbed, ran out and bit viciously. The specimens were taken about five miles south of the Nepoko while we were collecting accessories for the Museum group of okapis."

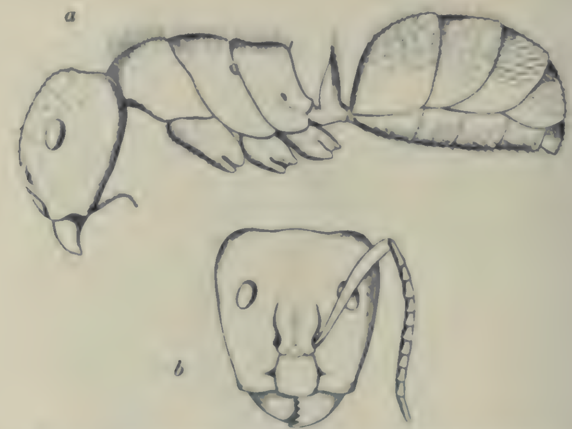


Fig. 64. *Camponotus (Orthonotomyrmex) vividus* subspecies *cato* (Forel). Worker major. *a*, body in profile; *b*, head, dorsal view.

Camponotus (Orthonotomyrmex) vividus subspecies **cato** (Forel)

Text Figure 64

Stanleyville, ♃, ☿, ♀; Garamba, ♃, ☿; Medje, ♃, ☿, ♀; Avakubi, ♃, ☿; Akenge, ☿; Thysville, ☿; Bengamisa, ♀, ♂; Niangara, ♀, ♂ (Lang and Chapin). The workers from Akenge, two in number, were taken from the stomach of a *Bufo polycercus*, a female from Medje was from the stomach of a *B. funereus*, and one from Stanleyville from the stomach of a frog (*Rana mascareniensis*).

Under separate numbers two different native names, "suma" and "likulu," are given for this ant. The specimens from Stanleyville were found "running up and down the trunks of big trees near the Tshopo River in great numbers;" those from Medje were found in similar situations and also crawling over the tents. "When crushed, they gave off a stench like bugs."

Camponotus (Orthonotomyrmex) sericeus (Fabricius)

Text Figure 65

Faradje, ☿; Poko, ☿; Medje, ☿ (Lang and Chapin); Kabare, ☿ (J. Bequaert). Numerous specimens, without further data. Map 43 shows the distribution of this species.

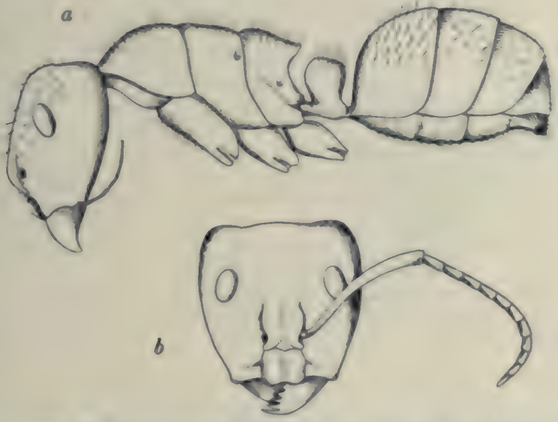
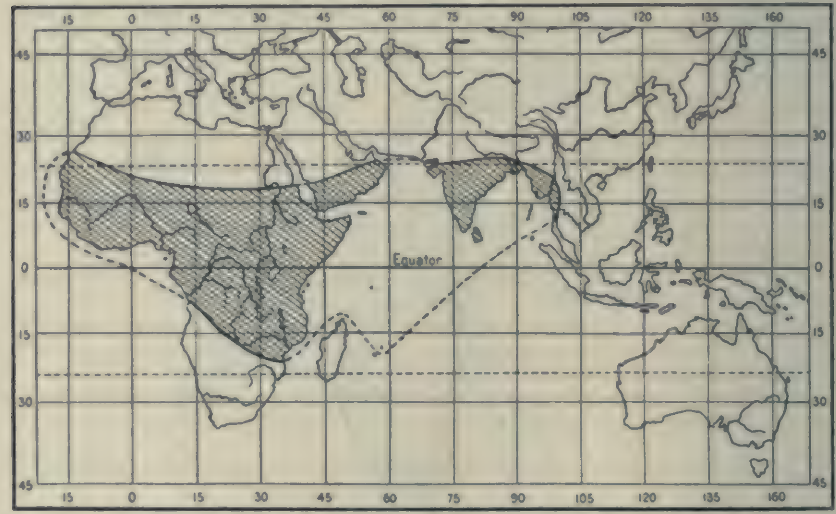


Fig. 65. *Camponotus (Orthonotomyrmex) sericeus* (Fabricius). Worker. *a*, body in profile; *b*, head, dorsal view.

Camponotus (Myrmotrema) foraminosus Forel, variety

Numerous workers and four males from Faradje and Avakubi, and probably several females from Stanleyville and Bengamisa (Lang and Chapin), belong to a variety of this species, which I refrain from naming, owing to the small amount of material of this extremely variable species in my collection. Prof. Emery, to whom specimens were submitted, writes that "the pubescence is more abundant and more golden than in Congo specimens sent by Forel as corresponding to the type of the species. The true type is a unique and is in the collection of the Museum of Geneva."

The specimens from Faradje were found "living in the hollow cavities of twigs and branches which they probably bored themselves. The cavities also contained numerous estivating snails, which were evidently not molested by the ants. The snails were so tightly attached to the surface that they were often broken when an attempt was made to remove them. About this time (the latter half of December and beginning of February) the grass is burned all over the country. The flames leap high and the heat is incredible, many of the branches of the trees being killed by the fire. This may be a reason for the snails' seeking refuge in the cavities made by the ants." The snails belonged to *Pachnodus herbigradus* Pilsbry.[1] (See p. 154).



Map 43. Distribution of *Camponotus* (*Orthonotomyrmex*) *sericeus* (Fabricius).

Camponotus (Myrmotrema) foraminosus subspecies **hæreticus** Santschi

A single worker major from Lukolela (Lang and Chapin) seems to be referable to this subspecies.

Camponotus (Myrmotrema) foraminosus subspecies **auropubens** Forel variety

A single minor worker from Stanleyville (Lang and Chapin), which I am unable to assign with certainty to any of the described forms of this subspecies.

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[1] Pilsbry, 1919, Bull. American Mus. Nat. Hist., XL, p. 308.

Camponotus (Myrmotrema) perrisii Forel subspecies **jucundus** Santschi

Text Figure 66

Kwamouth, ♃, ☿, ♀, ♂; Niangara, ♃, ☿; Faradje, ♃, ☿, ♀; Garamba, ♃, ☿ (Lang and Chapin). Many specimens, some of which were identified by Prof. Emery as belonging to this subspecies. Those from Kwamouth were found with their pupæ nesting in the galleries of a large, conical termitarium; those from Faradje were taken in small mushroom-shaped termitaria. Those from Niangara, however were nesting "in the hollow of a tree."

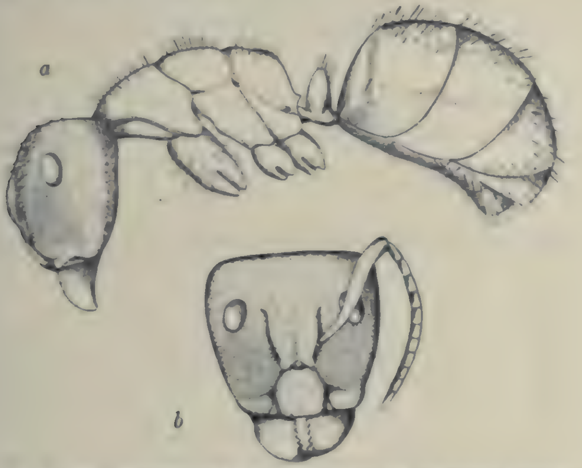


Fig. 66. *Camponotus* (*Myrmotrema*) *perrisii* subspecies *jucundus* Santschi. Worker major. *a*, body in profile; *b*, head, dorsal view.

The female of this subspecies measures 11 to 11.5 mm. (wings 12.5 mm.) and resembles the major worker very closely in sculpture, pilosity, and color, except that the erect whitish hairs are shorter and less numerous on the upper surface of the head and thorax. The antennal scapes are not so pale at their base. The wings are suffused with brown and have dark brown veins and pterostigma. The male measures 7 to 8 mm., is black throughout, with wings colored like those of the female, but paler. The scapes and hind tibiæ are distinctly flattened, though much less so than in the worker and female, and the upper border of the petiole is straight and transverse, with a small elevation or tooth on each corner. The body is rather shining; the thorax without erect hairs above.

Camponotus (Myrmotrema) perrisii subspecies **jucundus** variety **grandior** (Forel)

Yakuluku, ♃, ☿; Garamba, ♃, ☿ (Lang and Chapin). Numerous specimens. Those from Yakuluku were found "nesting in small mushroom-shaped termitaria, which were only about five yards apart."

Camponotus (Myrmotrema) olivieri (Forel) variety **sorptus** (Forel)

Seven minor workers taken at Kwamouth, Leopoldville, Lukolela, and Stanleyville (Lang and Chapin). The types were taken by Forel from the stomach of a pangolin (*Manis temmincki*).

Camponotus (Myrmotrema) bayeri Forel

Thirteen workers from Faradje (Lang and Chapin), without further data.

Camponotus (Myrmotrema) micipsa, new species

Text Figure 67

WORKER MAJOR.—

Length 9 to 10 mm.

Head large, longer than broad (without the mandibles, 3.8 × 3 mm.), broader behind than in front, with excised posterior border and evenly and very feebly convex sides. Mandibles very convex, with 6 short, subequal teeth. Clypeus rather flat, longer than broad, ecarinate and feebly longitudinally grooved in the middle, subhexagonal, narrower in front than behind, its anterior border somewhat truncated, straight. Frontal area impressed, lozenge-shaped; frontal carinæ widely separated, as far apart as their distance from the sides of the head. Antennal scapes distinctly flattened but not dilated, somewhat narrower at their tips than in *perrisii*, extending a little beyond the posterior corners of the head. Eyes rather small and flat. Promesonotal and mesoëpinotal sutures more impressed than in *perrisii;* the epinotum somewhat cuboidal, as long as broad, the base and declivity subequal, nearly rectangular in profile, the former flattened, the latter very feebly concave, both slightly submarginate on the sides. Petiole similar to that of *perrisii* but broader above, the upper margin feebly notched in the middle. Hind tibiæ somewhat flattened but neither prismatic nor channelled, their flexor borders without a row of bristles.

Mandibles, clypeus, upper surface of head, thorax, and gaster opaque; mandibular teeth, frontal area, antennal scapes, gula, sides of thorax, posterior surface of petiole, legs, and venter shining. Mandibles finely punctate on a very finely and evenly shagreened ground. Head very finely, densely and evenly punctate; the clypeus and cheeks with coarse, shallow, rather sparse, piligerous foveolæ, which are elongate and oblique, with their posterior edges more pronounced. Front and sides of head with similar but more scattered and less pronounced foveolæ. Antennal scapes covered with round punctures of very unequal size. Thorax and gaster very finely and densely punctate like the head, with small, rather sparse, piligerous punctures.

Hairs pale, yellow, coarse, erect, rather long and abundant on the upper surface of the head, thorax, and gaster and on the venter, absent on sides of thorax, petiole and gaster. On the cheeks and clypeus each foveole bears a short, stiff, blunt, suberect hair. Pubescence dull yellow, very short, dilute and inconspicuous on the head and thorax, but very long and dense on the dorsal surface of the gaster, where it forms a shining golden pelage nearly concealing the surface.

Coal black throughout, only the apical portions of the funiculi and the ends of the tarsi dark brown.

WORKER MEDIA.—

Length 7.5 mm.

Differing from the worker major only in the smaller and shorter head, which is not longer than wide behind. The foveolæ of the cheeks and clypeus are less distinct, but the stubby, erect golden hairs arising from them are as striking as in the major.

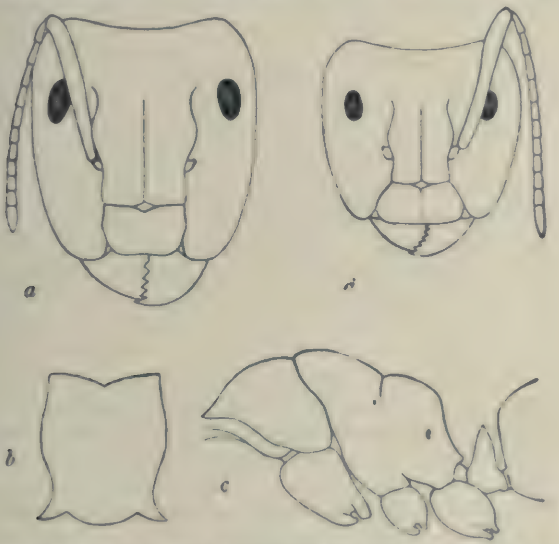


Fig. 67. *Camponotus (Myrmotrema) micipsa*, new species. *a*, head of worker maxima; *b*, clypeus of same; *c*, thorax and petiole of same in profile; *d*, head of worker media.

Described from three major workers and a single media "collected on the fire-wood taken aboard the boat between Leopoldville and Yumbi" (Lang and Chapin). This species is evidently allied to *perrisii*, *olivieri*, *bayeri*, and *maynei* Forel, but distinct from all of them in the structure of the head, sculpture, pilosity, etc., though apparently most closely related to *maynei*.

Camponotus (Myrmorhachis) polyrhachioides Emery

Lukolela, ☿, ♀ ; Lie, ☿ (Lang and Chapin). The workers from the latter locality, two in number, were taken from the stomach of a toad (*Bufo regularis*); the specimens from Lukolela, comprising two workers and three winged females, were found running on fire-wood.

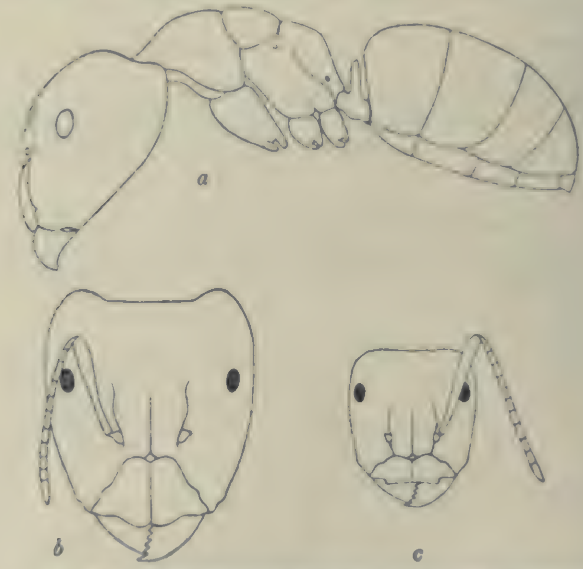


Fig. 68. *Camponotus (Myrmamblys) chapini*, new species. *a*, worker major, body in profile; *b*, head of same, dorsal view; *c*, head of worker minor.

Camponotus (Myrmamblys) chapini, new species

Text Figure 68

WORKER MAJOR.—

Length 5.5 to 6.5 mm.

Head very large in proportion to the remainder of the body, longer than broad (without the mandibles, 2.4 × 2.2 mm.), broader behind than in front, with deeply excised posterior, rather convex lateral borders and prominent, rounded posterior corners. Mandibles stout, convex, coarsely 6-toothed. Clypeus flattened, strongly carinate, its anterior border notched on each side, with a short median lobe, angularly emarginate in the middle and rounded at the corners. Frontal area obsolete; frontal groove distinct; frontal carinæ approximated in front, subparallel and widely separated behind, nearly as far apart as their distance from the lateral borders of the head. Eyes small and flat. Antennæ short, scapes (1.2 mm.) curved, somewhat flattened basally and thickened at their tips, which extend only about three times their greatest diameter beyond the eyes. Thorax small, short, and robust, not longer than the head, very broad through the pronotum, which is as broad as long, very rapidly narrowed to the laterally compressed epinotum; the meso- and epinotum together not longer than the pronotum. Promesonotal suture strongly impressed, metanotum very small and short, but distinct. In profile the general dorsal outline of the thorax is arcuate, but the mesonotum is somewhat raised in front at the suture above the pronotum; the epinotum sloping, rounded, with indistinct, subequal base and declivity. Petiole small, its scale elliptical from behind, evenly rounded above, with a slight angular projection in the middle of the superior border; in profile scarcely thicker below than above, much compressed anteroposteriorly, about three times as high as thick, with blunt superior border. Gaster much smaller than the head, the first segment anteriorly truncated, the dorsal surface convex. Legs rather stout, tibiæ slightly flattened, tarsal claws rather long.

Shining throughout; mandibles coarsely punctate, at their bases shagreened and subopaque. Clypeus and head sharply shagreened and covered with coarse, sparse punctures, which are very uniform on the clypeus and cheeks, somewhat shallower and more scattered on the front and vertex. Posterior corners of head with a few elongate foveolæ. Thorax and gaster more finely shagreened than the head, the gaster transversely, and both with scattered piligerous punctures.

Hairs yellow, sparse, coarse, erect, and rather short. Petiolar border with four setæ; gula with only a few short hairs; cheeks hairless. Scapes naked; tibiæ with numerous, very short subappressed hairs. Pubescence sparse, appressed, distinct, short on the mandibles, clypeus, and cheeks, longer on the gaster.

Head deep castaneous, almost black; mandibles and anterior portion of clypeus deep red; antennæ, pronotum, coxæ, and legs brownish yellow or testaceous; remainder of thorax, petiole, gaster, and an inverted V-shaped spot on the dorsal surface of the pronotum, pale castaneous.

WORKER MINOR.—

Length 3 to 4.5 mm.

Differing from the major in its much smaller size and the shape of the head, which is as broad as long, a little broader behind than in front, with straight sides and feebly convex posterior border. Clypeus strongly carinate as in the major, but its anterior lobe with straight entire anterior border and subdentate angles. Mandibles smoother than in the major, much less distinctly punctate. Antennal scapes extending about one-fifth their length beyond the posterior corners of the head.

Sculpture, pilosity, and color much as in the major worker, but the thorax uniformly brown throughout, and the head paler, though darker than the thorax and gaster.

Described from five major and eleven minor workers from Garamba (type locality), a major from Medje, and a minor from Faradje (Lang and Chapin). The specimen from the locality last mentioned is from the stomach of a frog (*Rana occipitalis*) and three of the workers from Garamba are from the stomach of a toad (*Bufo regularis*). According to a note accompanying the Garamba specimens, "these ants nest in small conical termitaria." And the further remark is added: "There are few of these termitaria without ants, which sometimes run about in the same galleries as the termites but seem more often to have no dealings with these insects."

PHASMOMYRMEX Stitz

WORKER.—Rather large, elongate, monomorphic, varying little in size. Head rectangular, with rounded posterior corners. Clypeus rather flat, indistinctly carinate, without an anterior lobe, its anterior border broadly and angularly excised. Thorax long, flattened above, obtusely marginate on the sides; anterior corners of pronotum angular; metanotum distinct, bounded by well-defined sutures anteriorly and posteriorly, its stigmata situated below its lateral marginations; mesometanotal suture impressed; epinotum subcuboidal, truncated behind. Petiolar node thick, with a distinct angle at the sides of its dorsal margin. Gaster small. Legs long, hind tibiæ three-sided.

FEMALE.—Head as in the worker. Thorax depressed, pronotum seen from above nearly as long as the mesonotum and overarched by the latter only very slightly. Scutellum not projecting over the postscutellum or epinotum. Wings as in *Camponotus*.

MALE unknown.

A single species, originally described by Forel as *Camponotus buchneri* and known only from the West African region, from Cameroon to Angola (Malange) and eastward to the Ituri forest.

Phasmomyrmex buchneri (Forel)

Lukolela, ☿; Avakubi, ☿; Medje, ☿ (Lang and Chapin); Lubutu, ☿ (J. Bequaert). Single specimens. Those from Avakubi and Lukolela were taken on fire-wood brought in from the forest.

POLYRHACHIS F. Smith

Large or medium-sized ants closely allied to *Camponotus*.

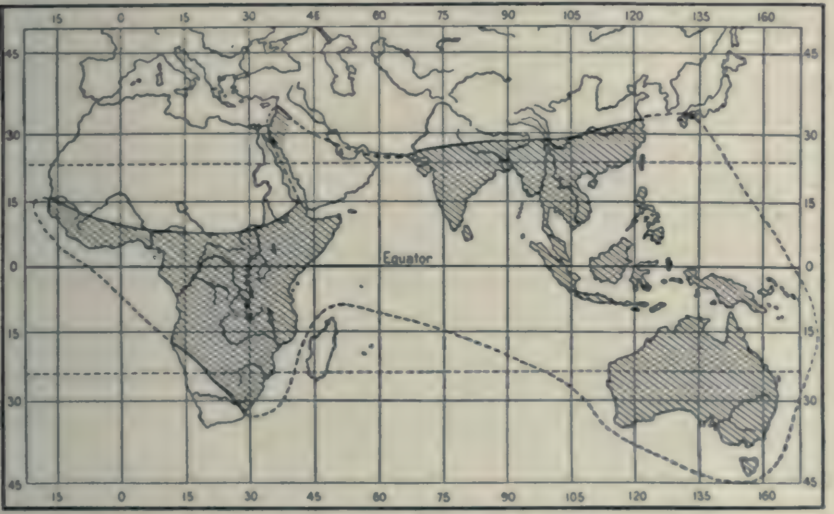
WORKER monomorphic. Head orbicular, oval or rounded subrectangular, very convex above, with very prominent, long and sinuate frontal carinæ. Palpi long, the maxillary pair 6-jointed, with the basal about half as long as the second joint, the labial pair 4-jointed. Clypeus well developed, usually convex or more or less carinate. Antennæ long, 12-jointed, the scapes inserted some distance behind the posterior border of the clypeus, as in *Camponotus;* funicular joints considerably longer than broad. Thorax more or less arcuate above, often more or less carinate on the sides, and more or less dentate or spinose, but exhibiting great differences in conformation in different species. Usually either the pronotum or the epinotum or both are armed with teeth or spines, rarely the mesonotum. The petiole has a large scale, the superior border of which is nearly always armed with pairs of spines or teeth, more rarely also with a median, unpaired spine or tooth. Gaster large, broadly elliptical or subglobular, very convex above, the first segment forming more than half of its surface and often more or less truncated or concave in front. Legs long and well developed, the tibiæ often constricted at the base. Gizzard much as in *Camponotus*.

FEMALE decidedly larger than the worker, with massive thorax. Spines and teeth on the thorax and petiole smaller. Wings long, the anterior pair with a radial and a single cubital cell; discoidal cell lacking and cubital vein usually reaching the outer margin of the wing. Gaster massive, its first segment often proportionally shorter than in the worker.

Male closely resembling the male of *Camponotus*, small and slender; the thorax and petiole quite unarmed, the latter with a low, thick scale. Frontal carinæ more approximated, front more convex, pronotum overarched by the mesonotum. External genital valves small and slender. Cerci distinct.

Pupæ enclosed in cocoons.

A large genus comprising several hundred species, many of which are among the most beautiful of ants, confined to the tropics of the Old World, though, like *Œcophylla*, absent from Madagascar (Map 44). The species of *Polyrhachis*, however, have a wider range, since a small number of forms occur as far north as Syria in Asia and as far south as the eastern Cape Colony and Tasmania. The majority of the species are aggregated in the Indomalayan, Papuan, and Australian Regions. Forel and I have divided the genus into subgenera, eleven of which, based on peculiarities in the structure of the thorax and petiole, have been recognized up to the present time, namely, *Polyrhachis, sensu stricto, Campomyrma* Wheeler, *Hagiomyrma* Wheeler, *Myrma* Billberg, *Hedomyrma* Forel, *Myrmhopla* Forel, *Chariomyrma* Forel, *Myrmatopa* Forel, *Cyrtomyrma* Forel, *Myrmothrinax* Forel, and *Dolichorhachis* Mann. In the Ethiopian Region only two of these, *Cyrtomyrma* and *Myrma*, are known to occur, the former represented by a very few aberrant species, the latter by a number of forms which show much greater diversity of structure than do the species of the same subgenus in the Indomalayan and Papuan Regions. This fact, together with that of the wide distribu-



Map 44. Distribution of the genus *Polyrhachis*.

tion of *Myrma*, would seem to indicate that it is the most archaic of all the subgenera of *Polyrhachis*.

The species of *Polyrhachis* form only moderately large colonies and none of them is sufficiently common to be of economic importance. Many of them are, in fact, rare and sporadic. They are very timid or pacific insects and are most frequently found singly walking up or down tree-trunks or on the foliage of trees or bushes. Their nesting habits are very diverse. According to my observations in Australia, the species of *Campomyrma* nest in the ground, under stones, or more rarely in crater nests. The same is true of the species of *Hagiomyrma* and *Chariomyrma*, though I have always found *P.* (*Hagiomyrma*) *semiaurata* Mayr in large logs and certain species of *Chariomyrma* in earthen termitaria. So far as known, none of the species of these three subgenera employs silk in the construction of the nest. The species of *Hedomyrma*, as Mann and I have observed, live in high trees, but we have been unable to find the nests. Several of the larger species of *Myrma* nest in the ground or in logs and some of them line their nests with silk spun by the larvæ. Many of the smaller species of this subgenus make carton and silken nests on or between the living leaves of trees, and this is the general habit also of many species of the subgenera *Myrmhopla*, *Myrmothrinax*, *Myrmatopa*, and *Cyrtomyrma*. A few species of *Myrma* and *Myrmhopla* live in hollow stems or in old galls. Jacobson and Mann have described the beautiful carton and silk nests built by various *Myrmatopa* species on the under sides of leaves in Java and the Solomon Islands. *P.* (*Myrmhopla*) *armata* of the Indomalayan Region sometimes builds its nest in houses. *P.* (*M.*) *dives* and some of the allied species construct small globular nests of nearly pure silk, somewhat like those of tent-caterpillars, on low bushes. The nest of one of the few species of the subgenus *Polyrhachis*, *sensu stricto*, the East Indian *P. bihamata*, was found by Bingham. "It was of silky, yellowish brown material, placed close to the ground in the center of a clump of bamboos, and measured about a foot in diameter." Some species of *Polyrhachis*, when irritated, emit a strong, pleasant smell. According to Bingham, the odor of *P.* (*Myrmhopla*) *venus* Forel is like that of the tuberose.

Polyrhachis (Myrma) laboriosa F. Smith

Plate XXII, Figure 2; Text Figure 69

Six workers from Stanleyville and Bafwasende, without further data and a number of workers, larvæ, and cocoons from a nest at Niangara (Lang and Chapin).

This species is easily distinguished from all the other African members of the genus by the peculiar petiole, which bears a single pair of long, hook-shaped spines. The nest (Pl. XXII, fig. 2) seen by Mr. Lang is described as follows. "It was found on a small tree about three meters from the ground and was 16 centimeters wide, built in a fork between a cluster of finer twigs and consisted of old vegetable fibres and leaves fastened together. It was naturally extremely light, as no soil had been used in its construction. The general color outside was dark gray. Its walls were very thin, scarcely one millimeter in thickness. As far as I could see, there were many entrances, though they were somewhat damaged. Still, a great many intact openings were visible. The fine hairs on the abdomen of this ant are conspicuously bronzy. When disturbed, the workers make a rattling noise by striking the nest with their abdomens. They bend the abdomen forward between their legs and discharge from its tip a copious spray of formic acid, which is quickly diffused through the air."

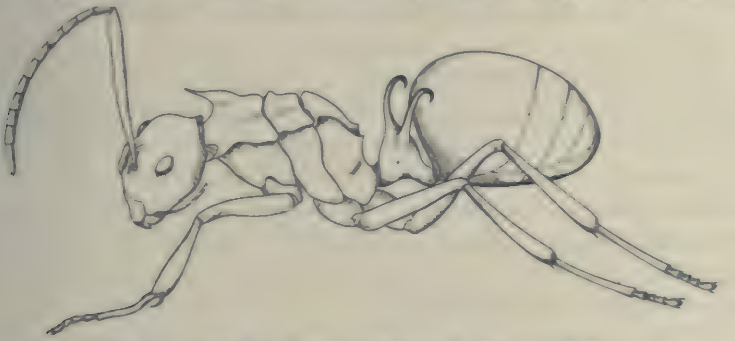


Fig. 69. ***Polyrhachis (Myrma) laboriosa* F. Smith. Worker.**

A nest of this ant, described and figured many years ago by Mayr and Aurivillius,[1] was 17 cm. long, 7.7 cm. broad, and 5 cm. thick. It was rather triangular in outline, with a large opening at one end and several small openings scattered over the surface. It was attached to some thin, leafy twigs and consisted of brown, fibrous vegetable detritus resembling decomposing cowdung, agglutinated "by means of a glue-like substance." The interior contained partitions of a similar structure.

Examination of the nest fragments contained in the vial with the workers from Niangara shows that the coarse vegetable particles are bound together by a small quantity of silk. This was also noticed by

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[1] 1896, Ent. Tidskr., XVII, p. 255, Pl. IV, fig. 3.

Santschi in two nests which he examined.[1] Concerning one of them, containing only the mother queen and her first brood of larvæ and still in process of construction, he remarks: "The walls of the nest already contain silk, which seems to show that the female is able to use the larvæ as shuttles, or perhaps the young larvæ spin the silk spontaneously around themselves on vegetable detritus placed at their disposal." That the latter supposition is probably erroneous is evident from what is known concerning the behavior of the female *Œcophylla* when founding her nest.

Polyrhachis (Myrma) militaris (Fabricius)

Stanleyville, ☿; Panga, ☿; Lukolela, ☿; Avakubi, ☿; Leopoldville, ☿; Medje, ☿; Lubila, ☿; Ngayu, ☿; Boyulu, ☿; Lie, ☿ (Lang and Chapin). Numerous specimens. Those from Ngayu, Boyulu, and Lie, four in number, were taken from the stomachs of toads (*Bufo funereus* and *regularis*). The only specimen from Lubila is "from a nest in a mushroom-shaped termitarium." Many of the specimens from the other localities were captured on fire-wood. Some of the workers have the pubescence on the gaster rather golden and therefore approach the subspecies *cupreopubescens* Forel.

The large Ethiopian species *Myrma*, comprising *militaris*, *schistacea*, *gagates*, *schlüteri*, and *nigriseta*, are so variable and exhibit so many annectant subspecies and varieties that one is tempted to regard the whole complex as a single, extraordinarily unstable species. Santschi, however, believes that there are several species with a pronounced tendency to hybridize. The materials in collections at the present time are quite insufficient to substantiate either of these views, and the matter must be left to some future myrmecologist, resident in equatorial Africa, who can study these ants intensively both in the field and in the laboratory.

Polyrhachis (Myrma) militaris subspecies **cupreopubescens** Forel

A fine series of workers and females taken at Avakubi from "a nest built in an upright rotten stump, about four feet from the ground" and a single female from Medje (Lang and Chapin).

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[1] 1909, Ann. Soc. Ent. France, LXXVIII, p. 393.

Polyrhachis (**Myrma**) **militaris** subspecies **cupreopubescens** variety **nkomoënsis** Forel

A single worker from Akenge, taken from the stomach of a toad (*Bufo polycercus*). As Forel states, the epinotal teeth of this variety are very long, erect, and strongly recurved. The middle pair of petiolar spines are more erect and less inclined backward than in the typical *cupreopubescens*, and the lateral spines are much longer, more slender, and farther from the median pair. The pubescence seems to be dimmer and less golden, but this may be due to the action of the toad's gastric juices.

Polyrhachis (**Myrma**) **militaris** subspecies **cupreopubescens** variety **dido,** new name

This name is suggested to replace *argentatus* Stitz, which is preoccupied by *P. argentatus* F. Smith [=*Formica argentata* Fabricius =*P. sexspinosa* (Latreille)].

I possess two workers of this beautiful variety from Mt. Coffee, Liberia, collected by R. P. Currie. The thorax, petiole, coxæ, and ventral portions of the gaster are covered with dense, brilliant, silver pubescence, the upper surface of the gaster with brilliant golden pubescence as in *cupreopubescens*. The lateral spines of the petiole are very short.

Polyrhachis (**Myrma**) **schistacea** (Gerstæcker) variety **divina** Forel

Thysville, ☿; Poko, ☿; Boma, ☿; Zambi, ☿ (Lang and Chapin); Zambi, ☿, ♀ (J. Bequaert). The specimens from Zambi were found climbing on grass-stalks in the savannah; the others bear no data except the localities. The nesting habits of this ant are very probably the same as those of the closely allied *gagates* (*vide infra*), also taken in the savannah and in the same locality.

Polyrhachis (**Myrma**) **schistacea** subspecies **rugulosa** (Mayr) variety **divinoides** Forel

A single worker from Banana (Lang and Chapin) seems to be referable to this variety.

Polyrhachis (**Myrma**) **schistacea** subspecies **atrociliata** Santschi variety **benguelensis** Santschi

Six workers from Yakuluku and one from Garamba (Lang and Chapin) run to this variety in Santschi's table.[1] The hairs on the body are black, short and sparse, whereas in the typical *atrociliata* they are long and abundant.

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[1] 1914, 'Voy Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 142

Polyrhachis (Myrma) gagates F. Smith

Plate XXIII, Figures 1 and 2; Text Figure 70

Numerous workers and females from Zambi (Lang and Chapin). The interesting nest of this species is represented on Pl. XXIII, figs. 1 and 2, from two of several photographs taken by Mr. Lang and accompanied by the following note. "These ants nest in the ground. The entrances to the nest are surrounded by an irregularly circular mound of white, loose sand, which measures about 40 cm. in diameter, the sand being heaped up to a height of 13 to 15 cm. In the center of the mound there is a tuft of grass (in one of the photos the stalks of the grasses have been cut off near the base, in order to show the entrances). In between the root-stocks of the tuft of grass, and leading into the nest there are numerous irregular entrances which are continued outside along the stalks, the sand being agglomerated with a sort of paper-like material so as to form a solid wall in strong contrast to the loose sand. The ground below the crater contains numerous galleries simply excavated in the sand. When the nest is disturbed, great numbers of ants run out and, when directly molested, discharge much formic acid. The chambers containing the larvæ, etc., were immediately beneath the surface. No more ants were encountered at a depth of 20 cm. so that the nest is rather shallow. A few individuals were seen outside at 11 A. M., in the fairly strong sunlight. We saw a great many more of these nests, but no other as large as the one photographed. All the nests were found on a sandy island in the Congo River near Zambi, June 30, 1915, at a short distance from the shore. They were scattered over a plain which is evidently inundated during the rainy season, but which was dry at the time of our visit." Mr. Lang's description suggests that a certain amount

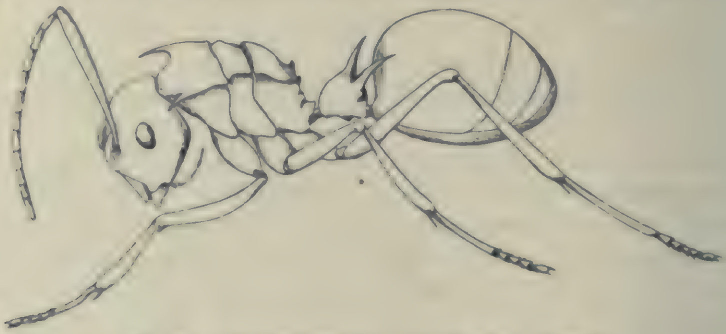


Fig. 70. *Polyrhachis (Myrma) gagates* F. Smith. Worker.

of silk may have been employed by the ants in the confection of the paper-like entrances, as in the nests of some other earth- or wood-inhabiting species of *Myrma*.

Polyrhachis (Myrma) atalanta, new species

Text Figure 71

FEMALE.—

Length somewhat less than 8 mm.; anterior wing 12 mm.

Head distinctly longer than broad, a little broader behind than in front, only moderately convex above, the portion behind the eyes short, with straight, scarcely marginate occipital border, the posterior corners rounded but distinct, the cheeks very feebly convex. Eyes large, prominent, somewhat less than hemispherical. Mandibles rather convex, with six coarse teeth. Clypeus convex, only moderately carinate, about twice as broad as long, its anterior border entire, nearly straight. Frontal area large, triangular; frontal carinæ approximated in front, very strongly sinuate and widely separated behind, the greatest distance between them being equal to their distance from the lateral borders of the head. Antennæ long, the scapes distinctly enlarged and slightly deflected at their tip., reaching about half their length beyond the posterior border of the head. Pronotum with two rather large, acute, diverging teeth, which are triangular, as long as broad at their base, and somewhat flattened. Mesonotum evenly convex, as broad as the head through the eyes, and as long as broad. Scutellum rather flat. Epinotum with rounded, convex base, which is about three-fifths as long as broad, measured along the sides, where it is bluntly marginate, its posterior corners with two recurved teeth, which are somewhat smaller and more slender than those of the pronotum, about twice as long as the width of their bases, directed outward, backward, and slightly upward. They are connected by a strong transverse carina, strongly curved forward in the middle and separating the base from the declivity, which is very much shorter than the base and very concave. Petiole as broad as high, very thick and strongly convex anteriorly and posteriorly, its anterior surface somewhat truncated below, its superior border bearing four broad, flat spines, very slightly incurved, and more strongly curved backwards especially at their tips. The inner pair is somewhat longer and broader than the outer. Gaster oval, the first segment not marginate on the sides and not very strongly truncated anteriorly. Legs rather stout, tibiæ distinctly constricted at their bases.

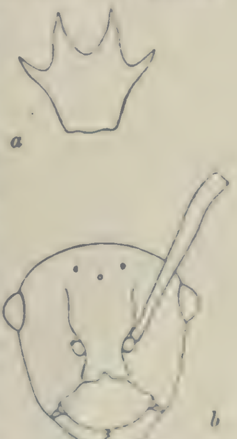


Fig. 71. *Polyrhachis (Myrma) atalanta,* new species. Female. *a*, petiole, anterior view; *b*, head from above

Rather shining throughout and strongly sculptured as follows: Mandibles sharply and rather coarsely striatopunctate; front and posterior portion of the head sharply longitudinally rugose; the rugæ on the clypeus, cheeks and sides of the head, however, irregular and more or less vermiculate. Upper surface of pronotum, mesonotum, scutellum, and base of epinotum sharply longitudinally rugose like the back of the head, the base of the epinotum more strongly. On the pronotum the rugæ diverge from the middle of the anterior border and there is also a similar, though less pronounced, tendency in the mesonotal rugæ; those on the epinotum are strongly arcuate on the sides. Sides of the thorax punctate-rugulose; anterior and posterior surfaces of the petiole transversely and rather vermiculately rugulose, except the tips of the spines, which are smooth and shining, as is also the declivity of the epinotum. Gaster very finely and densely punctate; the anterior two-thirds of the first segment longitudinally rugulose, the rugules being sharp and occasionally anastomosing. Scapes and tibiæ coarsely rugulose, with large, elongate piligerous punctures.

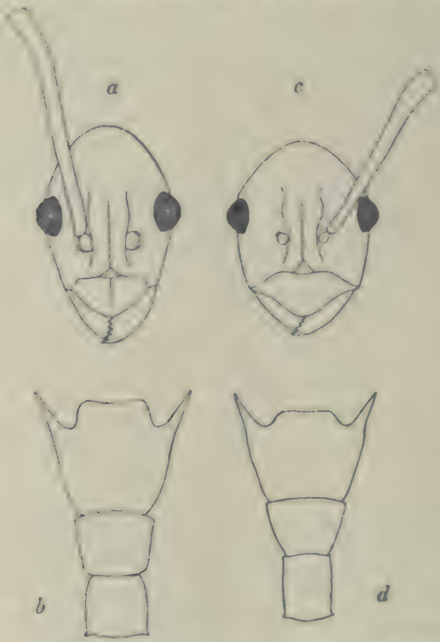


Fig. 72. *a*, *Polyrhachis* (*Myrma*) *concava* Ern. André, head of worker; *b*, thorax of same, dorsal view; *c*, *Polyrhachis* (*Myrma*) *atrope*, new species, head of worker; *d*, thorax of same, dorsal view.

Hairs silvery white, long, erect, abundant, covering the whole body, except the apical half of the funiculi; as conspicuous on the scapes, cheeks, and legs as on the thorax and gaster. Pubescence grayish, very fine, short, and appressed, distinct only on the gaster, where it is sufficiently abundant to dim the surface but not to conceal the sculpture.

Black; palpi, tibial spurs, and terminal joint of tarsi testaceous; tips of funiculi and wings brownish, the latter with pale brown veins and dark brown pterostigma.

A single specimen from Stanleyville (Lang and Chapin), without further data. This species is evidently very closely related to Ern. André's *P. sulcata*, which is also known only from the female. This form, however, according to the description, is slightly larger (9 mm.), has the mandibles very superficially and almost indistinctly rugose, the eyes are more than hemispherical; the rugæ on the epinotum are described as "transversalement arquées"; the petiole is higher than broad and the pilosity is duller. *P. atalanta* may eventually prove to be merely a subspecies of *sulcata*.

Polyrhachis (Myrma) concava Ern. André

Text Figure 72a and *b*

A single worker from Akenge, taken from the stomach of a toad (*Bufo funereus*), and a deälated female from Stanleyville (Lang and Chapin). Forel took several workers of this species from the stomach of a pangolin (*Manis temmincki*). Two of these specimens are in my collection.

Polyrhachis (Myrma) aërope, new species

Text Figure 72*c* and *d*

WORKER.—

Length somewhat less than 6 mm.

Head longer than broad, subelliptical, not broader behind than in front, narrowed behind the eyes to the occipital border, which is indistinctly marginate, very convex in the middle above through the frontal carinæ, the cheeks rather straight, the gular margin bluntly submarginate. Eyes at the middle of the sides of the head, large, prominent, broadly elliptical, their external orbits slightly sinuate. Mandibles narrow, their apical borders rather oblique, with five subequal teeth. Clypeus convex, bluntly carinate in the middle, its anterior border broadly rounded, entire. Frontal area broadly triangular, indistinct; frontal carinæ high, rather closely approximated, moderately sinuate, somewhat farther apart and subparallel behind. Antennæ long, scapes slightly enlarged and deflected at their tips, extending fully one-half their length beyond the posterior border of the head. Thorax much like that of *P. concava* Ern. André, long and narrow, the dorsal surface concave with strong, upturned lateral carinæ, notched at the pronounced, transverse promesonotal and mesoëpinotal sutures. Pronotum as long as broad, narrowed behind, its anterior spines straight, acute, slightly divergent, flattened, more than twice as long as their width at the base. Mesonotum trapezoidal like the pronotum, but smaller and broader than long; base of epinotum regularly rectangular, one and one-third times as long as broad, its posterior corners with two small, erect, slightly recurved teeth, which are as long as broad at their bases, its posterior border not marginate but, as in *concava*, passing over into the sloping declivity, which is slightly longer than the base and feebly convex in profile. Petiole and gaster shaped as in *concava*, but with the median pair of spines of the former straight, when seen from the front, and not slightly curved inward. Tibiæ distinctly constricted at their bases.

Shining; gaster smooth and polished. Mandibles finely striated and sparsely and finely punctate; head, thorax, and petiole finely coriaceous or shagreened; the clypeus somewhat smoother. Gaster very minutely and superficially punctate.

Hairs and pubescence whitish, the former erect, very sparse, present only on the tip of the gaster and posterior portion of venter; the pubescence very short and dilute, delicate, and appressed, visible only on the sides of the thorax and on the clypeus and appendages.

Black; only the palpi and insertions of the antennæ reddish.

Described from a single specimen from the stomach of a frog (*Xenopus mülleri*) taken at Niangara (Lang and Chapin).

This form is so close to *concava* André that it might be regarded as a subspecies. It differs, however, very decidedly in the proportions of the head and thorax, as shown in the accompanying figures, and is also smaller (*concava* measures nearly 7 mm); the pubescence on the body is much less developed and the legs are darker.

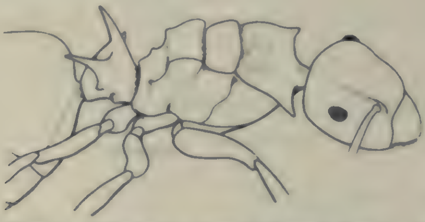


Fig. 73. ***Polyrhachis (Myrma) alluaudi* Emery. Head, thorax, and petiole of worker; after Emery (1891).**

Polyrhachis (Myrma) alluaudi Emery variety **anteplana** Forel

Text Figures 73 and 74

A single worker taken from the stomach of a frog (*Phrynobatrachus perpalmatus*) captured at Stanleyville (Lang and Chapin).

This variety, originally described from the same locality, differs from the typical *alluaudi* by "the epinotum and its teeth being longer, the pronotum flatter. The transverse mesoëpinotal fissure is vertical, very narrow and deep. The teeth of the epinotum are triangular, slightly curved forward; the spines of the pronotum are less than twice as long as their width at the base."

The worker and nest of the typical form were described and figured by Emery in 1892 from specimens taken by Alluaud in Assinie. I reproduce the figures (Figs. 73 and 74) because of the peculiar and interesting structure of the nest, which Emery describes in the following words: "The nest was found on a bush, 1.70 m. from the ground, attached to the lower surface of a leaf. It consists of a single low-vaulted chamber, with the entrance prolonged as a kind of chimney. Its walls are made of rather coarse vegetable particles loosely glued together."

Polyrhachis (Myrma) nigrita Mayr

A single worker from Akenge (Lang and Chapin), taken from the stomach of a toad (*Bufo polycercus*).

Polyrhachis (Myrma) decemdentata Ern. André

Text Figure 75

A winged female from Stanleyville (Lang and Chapin) and a single worker from Malela (J. Bequaert).

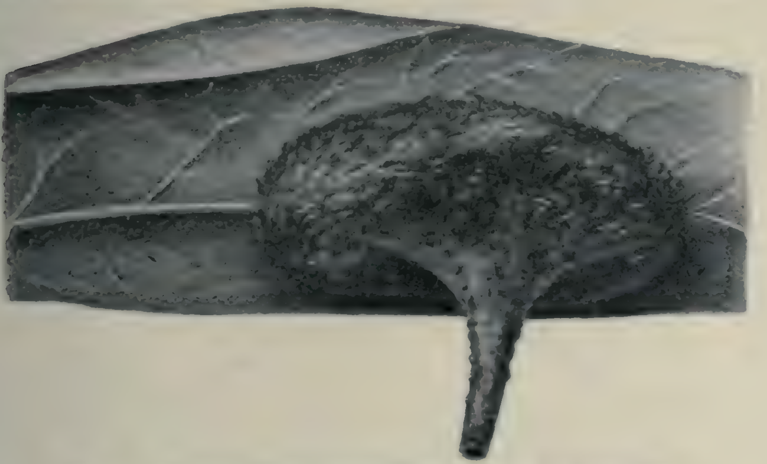


Fig. 74. *Polyrhachis* (*Myrma*) *alluaudi* Emery. Nest; after Emery (1891).

Polyrhachis (Myrma) viscosa F. Smith?

The thoraces of five workers taken from the stomach of a toad (*Bufo tuberosus*) captured at Ngayu (Lang and Chapin) seem to belong to this species.

Polyrhachis (Myrma) revoili Ern. André

Five deälated females taken by Bequaert at Malela are doubtfully referred to this species.

Polyrhachis (Myrma) bequaerti, new species

Text Figure 76

WORKER.—

Length 4 to 4.5 mm.

Head, without the mandibles, scarcely longer than broad, broader behind than in front, with feebly convex posterior border and nearly straight, anteriorly converging sides, in profile nearly as high as long. Eyes moderately large and convex, broadly elliptical, their anterior orbits at the median transverse diameter of the head. Mandibles feebly convex, with five acute, subequal teeth. Clypeus convex, carinate, especially behind, the anterior border evenly rounded, entire. Frontal area very indistinct; frontal carinæ very long and rather far apart, feebly sinuate, subparallel behind. Antennæ stout, the scapes only slightly enlarged and scarcely deflected at their tips, extending about one third their length beyond the posterior border of the head. Thorax short, as high as long, the dorsal surface strongly carinate laterally, the border deeply notched at the pronounced promesonotal and mesoepinotal sutures, especially at the latter. Pronotum very broad, without the neck nearly twice as broad as long, decidedly broader in front than behind, at the anterior angles with rather large, acute, triangular spines, which are flattened, diverging, and fully as long as broad at their bases. The surface of the pronotum is feebly convex. Mesonotum short and rather flat, more than twice as broad as long, narrower behind than in front, where it is almost as broad as the posterior border of the pronotum; its sides straight, but rounded at the corners. Epinotum extremely short, abruptly sloping, the base and declivity being in the same plane, the former strongly convex in front just behind the mesoëpinotal suture, or fissure, which is much more deeply impressed than the promesonotal suture. The posterior corners of the base bear acute, slender, erect, recurved spines, which are fully twice as long as the diameter of their insertions. The surface of the base is bluntly and longitudinally carinate in the middle, the declivity feebly concave. Seen from behind, the base is distinctly broader than long, a little broader behind than in front, with convex, arcuate sides; the declivity, however, has concave and more feebly marginate lateral borders. Petiole thick, very convex anteriorly and posteriorly, especially anteriorly, as broad as high, its blunt upper border with four long, slender, acute, equidistant spines, the outer pair distinctly longer than the inner and all directed upward and somewhat backward, with their tips somewhat more strongly curved than their bases. Gaster subglobular, very slightly broader than long, very convex above, the first segment concave anteriorly for the accommodation of the convex posterior surface of the petiole. Legs rather stout, tibiæ distinctly constricted at the base.

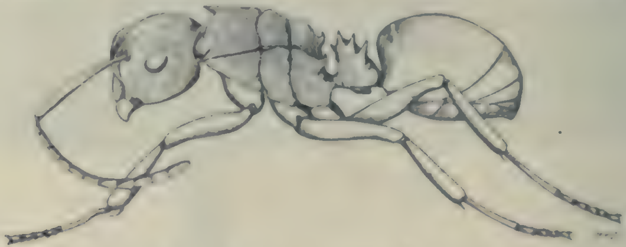


Fig. 75. *Polyrhachis (Myrma) decemdentata* Ern. André. Worker.

Shining; mandibles smooth, with rather coarse scattered punctures; clypeus, cheeks, and anterior portion of front very smooth and shining; remainder of head regularly and rather finely longitudinally rugose, with punctate interrugal spaces. Pronotum and mesonotum above sharply and regularly longitudinally rugose, the rugæ on the former coarser than on the head, on the latter radiating backward from a point in the middle of the anterior border. Base of epinotum with very regular transverse rugæ, which are even sharper than those on the pronotum, giving the surface the appearance of a washboard. Lower pleuræ finely punctate-rugulose, passing above into parallel rugæ, which are longitudinal on the sides of the pro- and mesonotum and nearly perpendicular on the epinotum. Epinotal declivity rugulose-punctate, the rugules in the middle distinctly transverse. Anterior and posterior surfaces of petiole with similar sculpture, but the rugules somewhat less clearly transverse. Gaster smooth and shining, very finely and regularly reticulate. Legs finely and transversely shagreened.

Hairs whitish, delicate, erect, sparse, conspicuous only on the thoracic dorsum, tip of gaster, venter, and dorsal surface of head. Pubescence pale, short, fine, and appressed; rather dilute, longer, and sparser on the gaster; denser on the appendages.

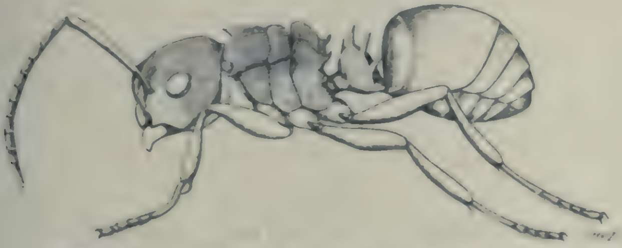


Fig. 76. *Polyrhachis (Myrma) bequaerti*, new species. Worker.

Black; mandibles, funiculi, tibiæ, and insertions and tips of scapes castaneous; palpi somewhat paler; femora and tarsi a little darker.

Described from fifteen specimens collected by Dr. Bequaert in the virgin forest at Utiasiki, between Lubutu and Kirundu. They were taken, together with their larvæ and pupæ, from a nest consisting of two leaves united by a soft tissue composed of fibrous, gnawed vegetable particles and silk.

This exquisite ant clearly belongs to the group comprising *fissa* Mayr and *monista* Santschi, but is quite distinct from any of the described species.

PLATE II

Temporary nest of the driver ant *Dorylus (Anomma) wilverthi* Emery, at Akenge October 17, 1913. This nest extended over 3.50 m. and could not be shown entirely in the picture.

PLATE III

Army of driver ants, *Dorylus* (*Anomma*) *wilverthi* Emery, on the march near Avakubi, October 22, 1909.

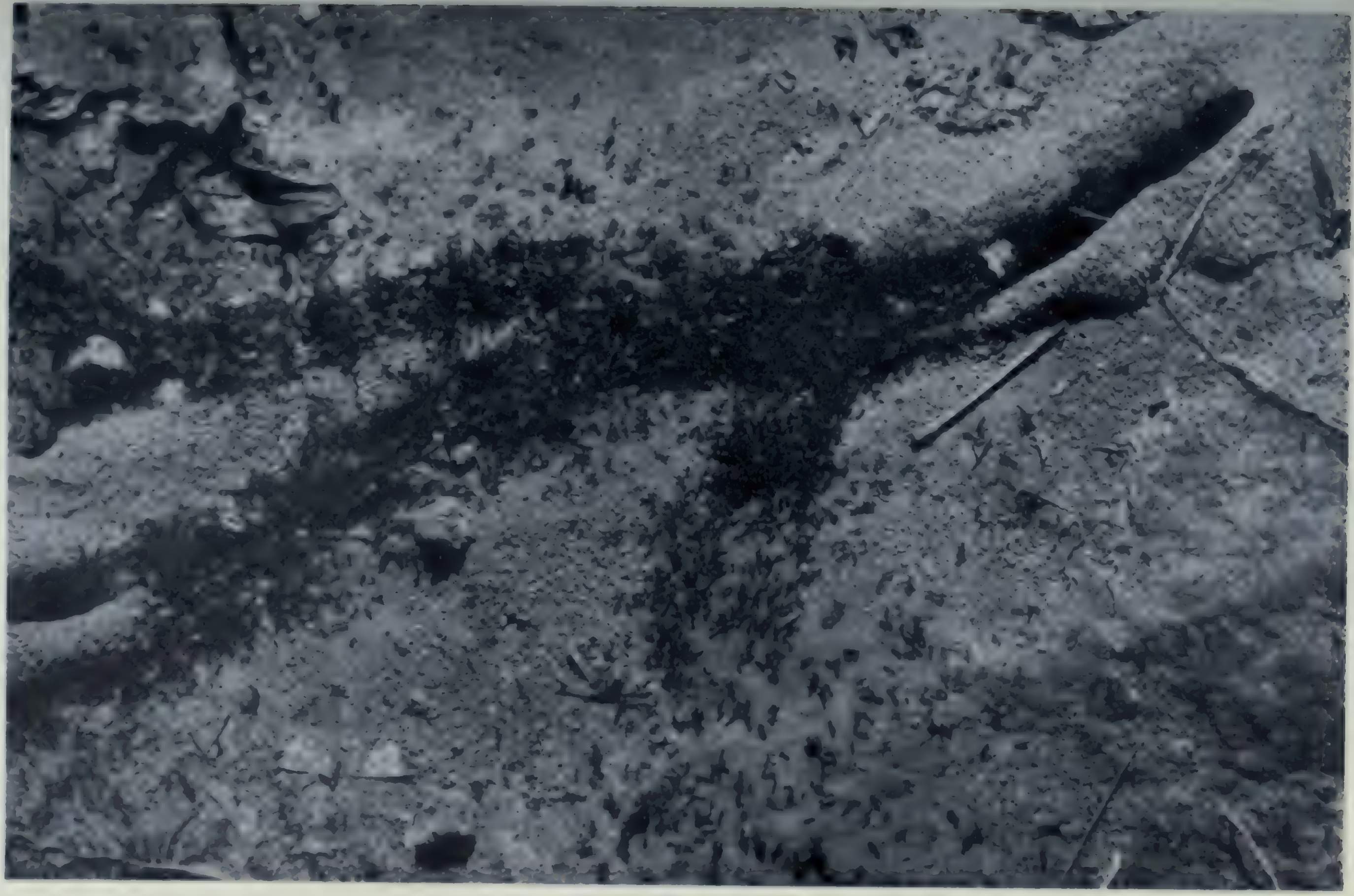


PLATE IV

Dorylus (*Anomma*) *wilverthi* Emery, at Avakubi, October 30, 1909.

Fig. 1. Worker ants covering in dense masses the larvæ and pupæ among leaves of pineapple and grass, on a temporary halt of the column.

Fig. 2. Part of an army with workers swarming over the low vegetation. The mounds cover a portion of the temporary nest and consist of particles of earth dug out by the ants and loosely connected. There are a great number of openings to such a nest.

1

2

PLATE V

Dorylus (*Anomma*) *nigricans* Illiger, at Amani, Usambara, East Africa

Fig. 1. Army of driver ants crossing a ditch.

Fig. 2. Army overwhelming a white rabbit.

Photographs by Dr. J. Vosseler

1

2

PLATE VI

Fig. 1. *Dorylus* (*Anomma*) *nigricans* Illiger, at Amani, Usambara, East Africa. Army crossing a path. The workers carrying the brood pass between solid walls of soldiers which, with their mandibles lifted and wide open, protect the main body of the army.

Photograph by Dr. J. Vosseler

Fig. 2. *Megaponera fœtens* (Fabricius), at Avakubi, October 22, 1909. Entrance to a nest, surrounded by a small mound of excavated earth, situated in a deserted plantation. When dug up, five galleries were found to open into the single aperture. On two occasions Mr. Lang observed from 30 to 40 pupa cases lying outside in the sun, near the entrance, with a few ants in steady attendance. There are no true chambers in the nest, but the galleries for the pupæ and larvæ are rather wide. When touched, these insects sting before using the mandibles, which can even pierce the thick skin of the hand. The columns of these ants contain relatively few individuals and, when closely approached, break up at once, the members scurrying nervously in all directions and making a stridulating noise. After a minute or so they reform the ranks and continue their march. They are great termite robbers, and Mr. Lang counted as many as eight such insects held between the mandibles of a single ant. They never opened the jaws to drop their prey, even when taken up with the forceps.

1

2

PLATE VII

Pheidole saxicola Wheeler, at Zambi, June 1915. This seed-storing ant works chiefly during the night and early morning, forming columns in various directions to forage. Near the entrances to the nests heaps of refuse are shown, consisting of seeds and chaff, and often also of dead ants and other insects.

PLATE VIII

Myrmicaria eumenoides subspecies *opaciventris* (Emery).

Fig. 1. Crescent-shaped craters of excavated earth at the entrances to nests in level, hardened soil at Rungu, July 7, 1913. The ants usually burrow their galleries after a heavy rain, either by day or night. The workers then busily carry out particles of soil which they drop near the edge of the crater. Often the moist earth does not roll down but sticks to the upper margin which thus becomes an overhanging crest. The mounds in the photograph are of typical form, but some of the best are often twice as high (5 to 6 cm.). It is said that these craters suggested the shape of the famous hairdresses of the Mangbetu tribe.

Fig. 2. Crescent-shaped crater at the entrance to a nest at Avakubi, October 22, 1909. In this case it was not as true to form as those shown in Fig. 1 because the entrances were placed near the base of a bush. The galleries showed many ramifications and extended 17 inches below the surface; but the whole nest, when exposed, did not cover an area more than two feet in diameter. Most of the pupæ were found about the roots of the bush. These harmless and common ants also build subterranean tunnels in various directions from their nest and make themselves noticeable by their immediate appearance in great numbers around a piece of meat or dead insect.

1

2

Plate IX

Myrmicaria salambo Wheeler. Low tree of the genus *Protea* from the Savannah at Garamba, September 1912, on the buds of which this ant attends scale insects.

Fig. 1. A flowering branch of the tree.

Fig. 2. The entire tree in its typical surroundings. This plant is a characteristic element of the extreme northeastern Congo Savannah, on the divide between the Congo and the Nile. It does not extend southwest of Faradje.

1

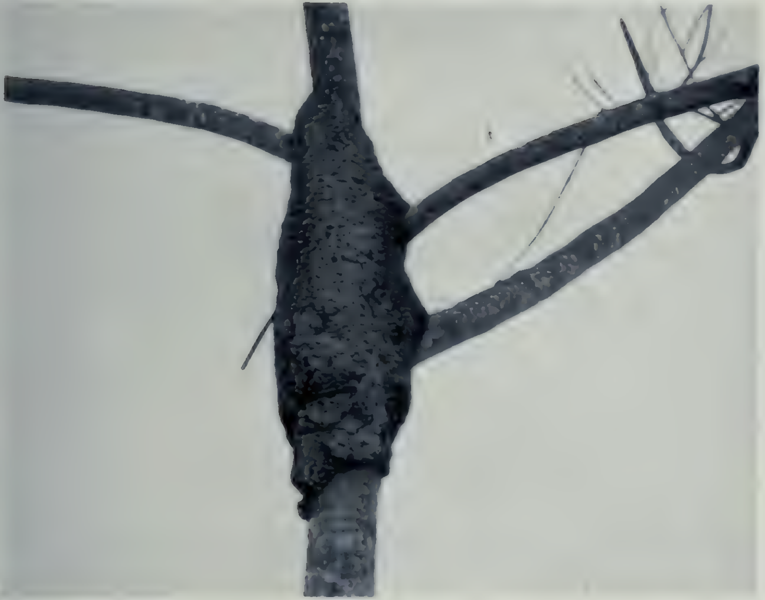
2

Plate XI

Crematogaster (Atopogyne) theta (Forel).

Fig. 1. Carton nest at Stanleyville, August 10, 1909, built on the trunk of a tree, about 5 feet from the ground.

Fig. 2. Another nest of this species in the same locality, but of different shape



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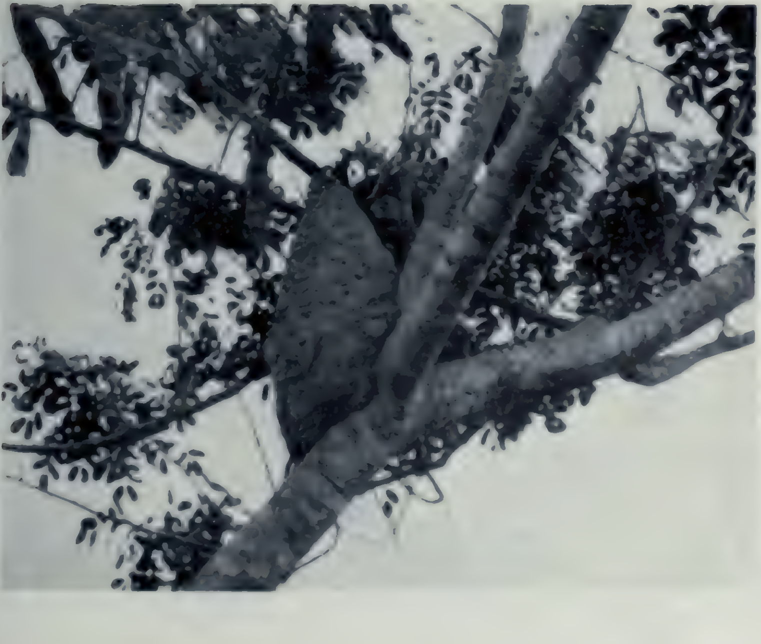

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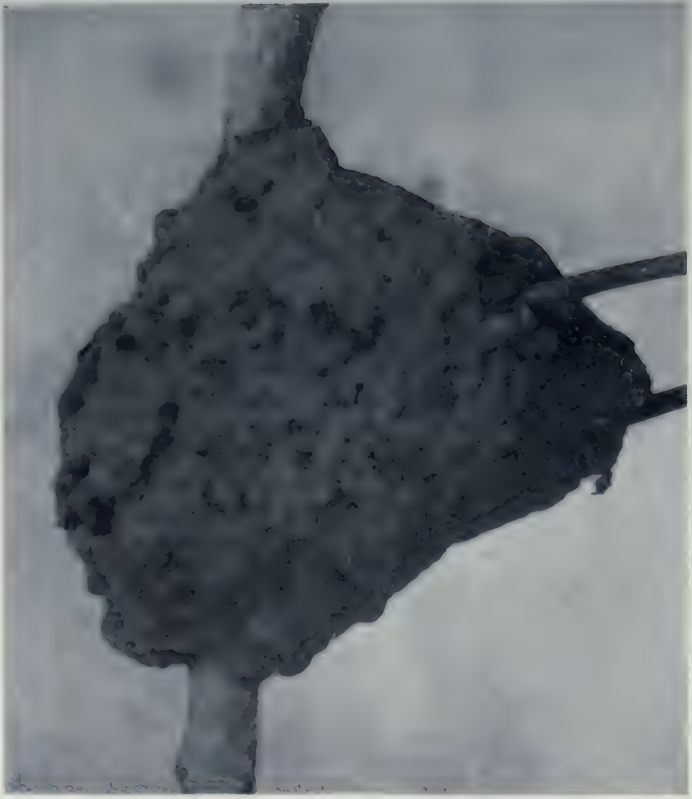
Plate XII

Crematogaster (Atopogyne) theta (Forel), at Medje, June 15, 1914.

Fig. 1. Outside view of a carton nest made of vegetable matter of very light gray or brownish color. The caterpillar shown on Plate XIII, fig. 1 was crawling over the surface of this nest.

Fig. 2. Inside, cross-section view of the same nest. The white masses are the brood (eggs, larvae, and pupae). The structure was 10.4 cm. broad and 9.8 cm. long and attached to a small tree in the forest, about 8 feet from the ground. When disturbed, the ants stream outside and let themselves drop upon the intruder. Their sting is painful and can be felt for many minutes afterwards.



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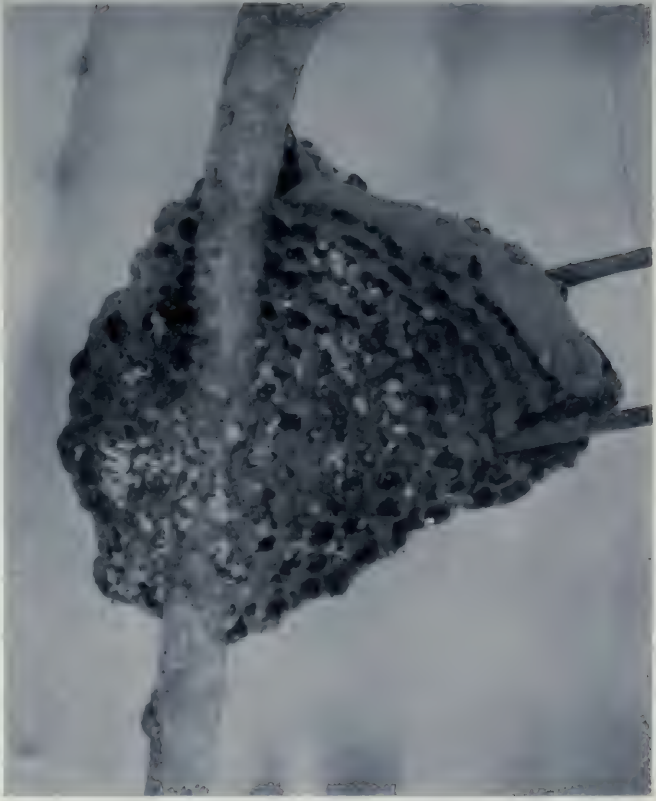

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Plate XIII

Fig. 1. Portion of the outer surface of the nest of *Crematogaster* (*Atopogyne*) *theta* (Forel) shown on Plate XII. In the upper right corner is seen a caterpillar that was found crawling over the surface, its segmentation being visible at the time; but when the creature stops and tightly adheres to the nest, its body becomes quite unnoticeable as it then resembles one of the numerous protuberances of the formicary.

Fig. 2. Nest of *Crematogaster* (*Nematocrema*) *stadelmanni* variety *dolichocephala* (Santschi), at Kwamouth, July 14, 1914. This cone-shaped carton nest was hanging in a tree, about nine feet from the ground. It was fastened to several small branches in such a way that it moved about when the boughs were tapped with a stick. The outside surface was quite rough and simulated crumpled up leaves that cover one another like the shingles of a roof. The cellular structure inside was irregular, with very thin walls, and a great many exits; larvæ were especially abundant in the lower portion. It measured about 18 inches in length and 11 inches in width at the top.

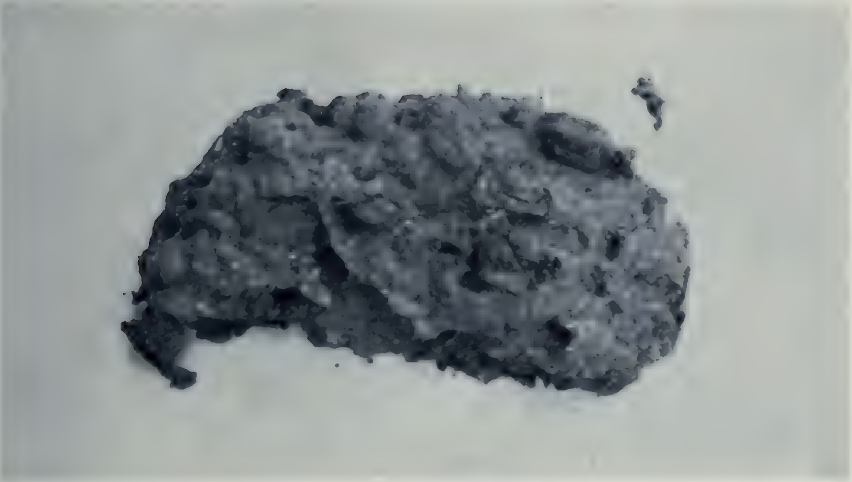

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PLATE XIV

Crematogaster (Nematocrema) stadelmanni **variety** *dolichocephala* (Santschi), at Bengamisa, September 27, 1914. Pensile nest of very hard, woody carton, resembling that of certain termites in shape as well as in material, a fact usually making it impossible to tell from the outside appearance which insect inhabits it. The example photographed was so fixed to several creepers that it swayed in the wind about twenty-five feet from the ground. It was approximately two feet long. The shape and size of these carton nests vary greatly according to the location. Their inner structure is irregular, the galleries and cells seemingly arranged without plan: larvæ and pupæ may be found anywhere throughout the formicary.

PLATE XV

Landscape in the Savannah near Niangara, May 10, 1913, showing numerous hillocks of *Termes natalensis* Haviland scattered over an almost treeless grass plain. The ant *Carebara osborni* Wheeler lives in cleptobiosis with these termites.

Plate XVI

Mushroom garden of *Acanthotermes militaris* (Hagen) from a nest at Malela, July 6, 1915. The minute ant, *Pædalgus termitolestes* Wheeler, had established its nest close to the surface in the upper part of the termitarium (upper right hand corner).

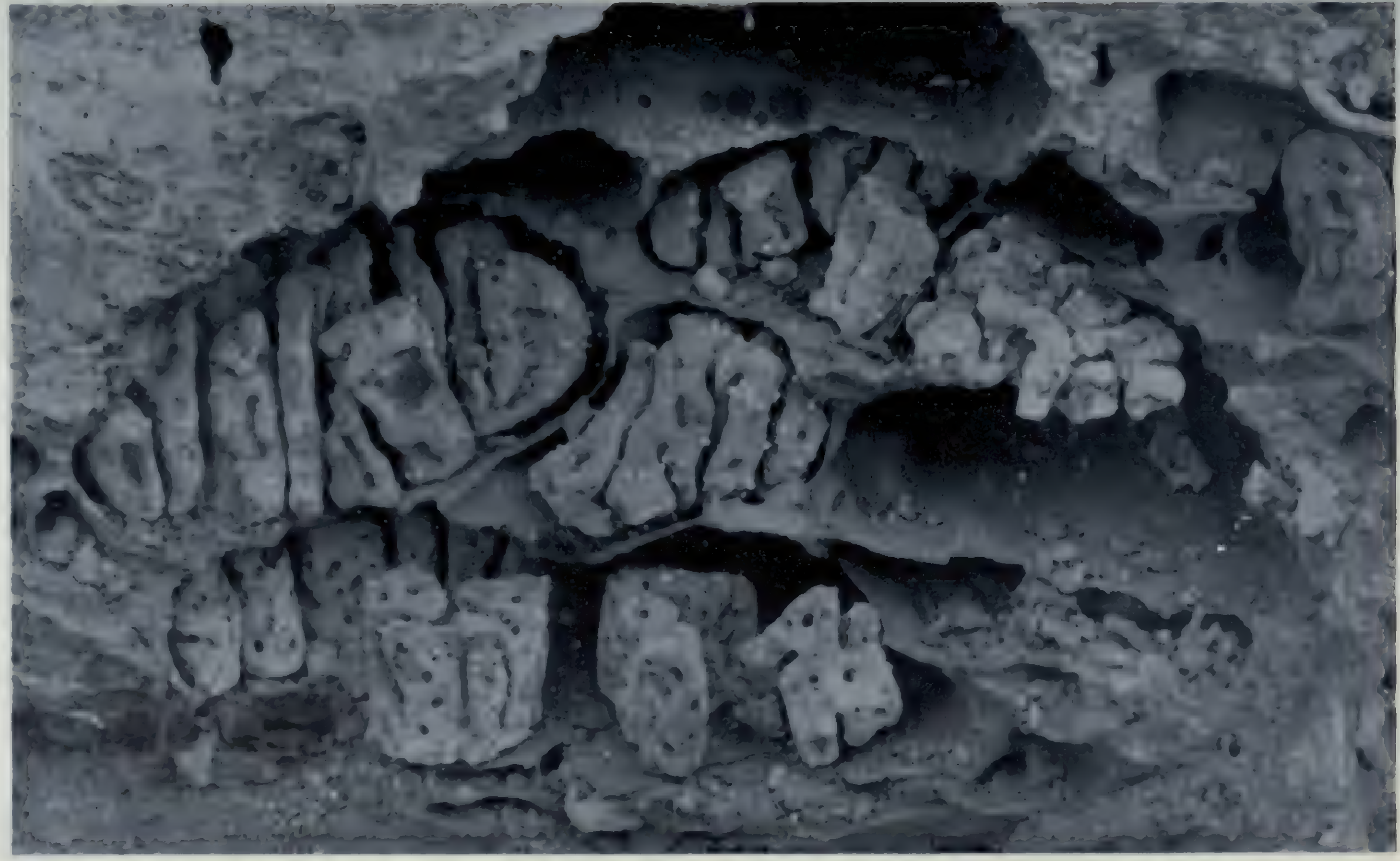
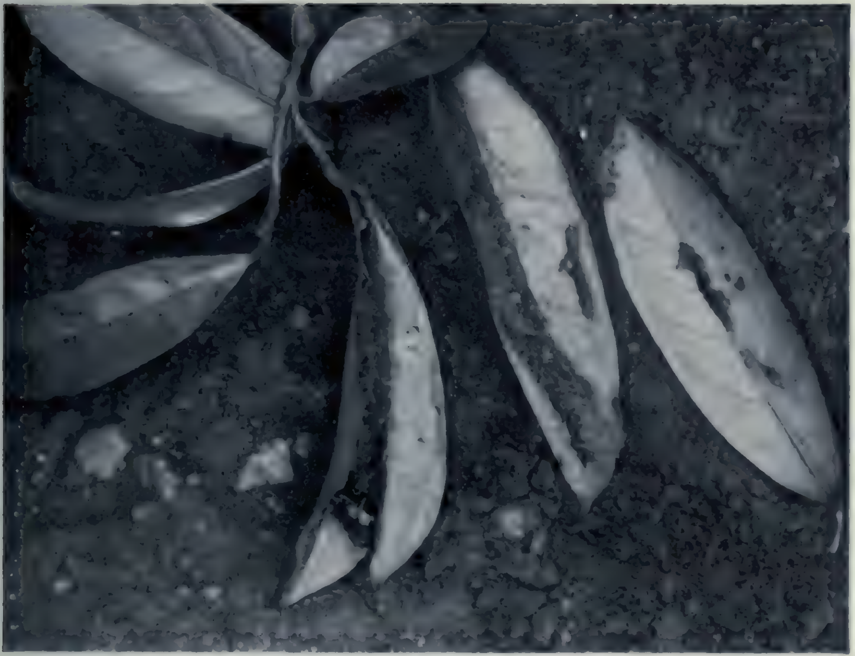


PLATE XVII

Fig. 1. *Macromischoides aculeatus* (Mayr), at Medje, May 1914. Two nests of these small ants, built with loosely connected vegetable fibres between leaves.

Fig. 2. *Tetramorium sericeiventre* subspecies *continentis* (Forel), at Zambi. June 30, 1915. Craters of white sand at the entrances to the nest of these ants.



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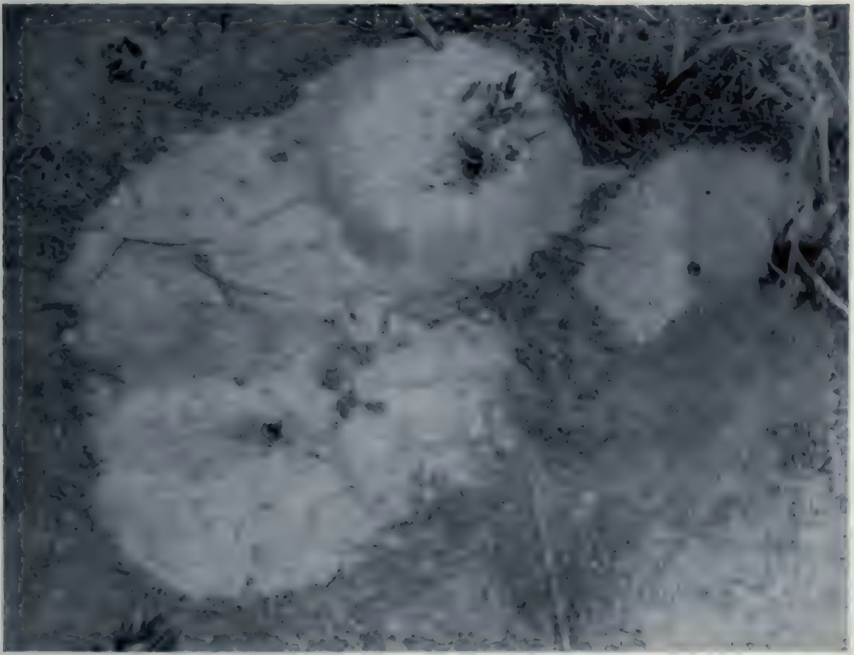

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PLATE XVIII

Tetramorium setigerum **subspecies** *quaerens* Forel, at Niapu.

Fig. 1. Regular ring-shaped craters of loose particles of soil constructed about the entrance of the nest during the rainy season. These ants are very common in open places.

Fig. 2. Aspect of the entrance to the nest of the same ant during the dry season. At that time the insects merely carry out débris and particles of soil without attempting to construct a crater.

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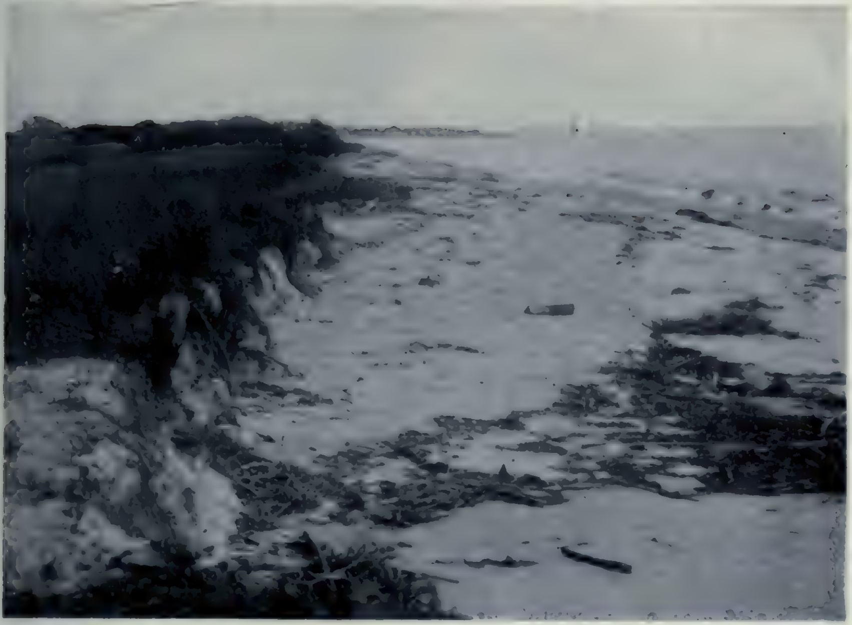
PLATE XIX

Plagiolepis (Anoplolepis) custodiens (F. Smith).

Fig. 1. Shore of the Atlantic Ocean a short distance north of Banana, showing the narrow beach of white sand in the upper part of which the nests of *P. custodiens* are excavated.

Photograph by J. Bequaert

Fig. 2. Nest of *P. custodiens* in the sandy beach of the Atlantic near Banana, August 1915.



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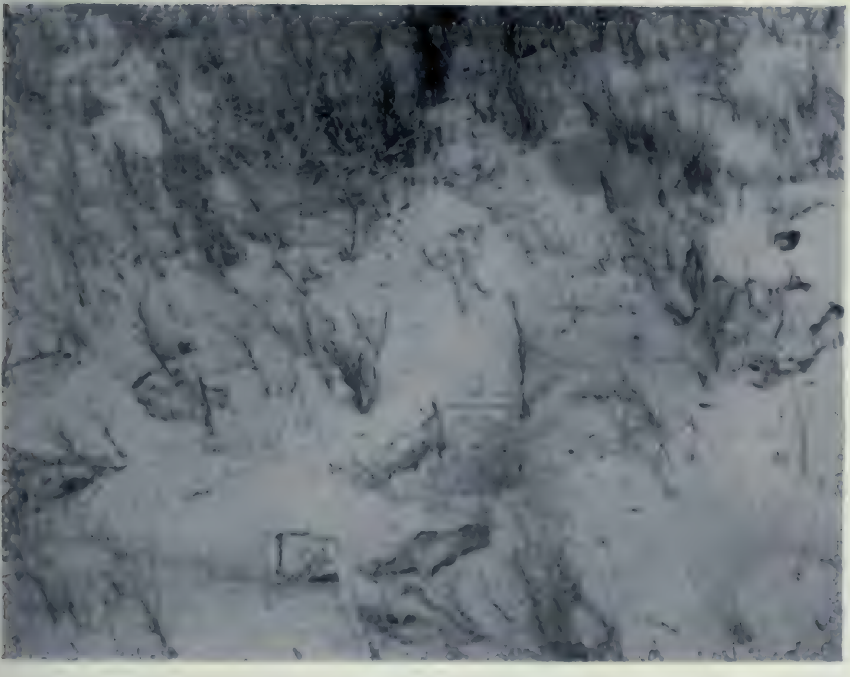

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PLATE XX

Œcophylla longinoda (Latreille), at Malela, July 5, 1915. The nests of this ant consist of leaflets closely woven together with white silk. These were found in a thorny bush about three feet from the ground. In order to photograph them the compound leaves of the plant were cut off and laid on the ground.

Fig. 1. Six leaflets have been united into one nest.

Fig. 2. A closer view of another formicary of the same species.

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PLATE XXI

Fig. 1. Carton nest of a termite about five feet from the ground; deserted by its builder and now occupied by a colony of *Camponotus (Orthonotomyrmex) viridus* (F. Smith); near Malela, July 7, 1915. The structure was established around the stem of a sapling in swampy woods.

Fig. 2. Interior of the same nest, showing the chambers excavated by the ants in the termitarium.

1

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Plate XXII

Fig. 1. Craters of white sand at the entrances to the subterranean nest of *Camponotus* (*Myrmosericus*) *rufoglaucus* subspecies *syphax* Wheeler, at Zambi, June 30, 1915.

Fig. 2. Nest of *Polyrhachis* (*Myrma*) *laboriosa* F. Smith, at Niangara, November 1910. It was built in a fork of a bush in a cluster of fine twigs, and consisted of old vegetable fibres and leaves fastened together. It was extremely light since no soil entered into its construction; dark gray outside, brown inside. Though the nest was somewhat damaged there were apparently many exits. When disturbed, the ants made a rattling noise by striking the nest with their gaster; at the same time they emited considerable quantities of formic acid. bending their gaster forward between the legs.

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PLATE XXIII

Nests of *Polyrhachis (Myrma) gagates* F. Smith, excavated in sandy soil at Zambi. June 30, 1915.

Fig. 1. Craters of white sand surrounding the entrances from which the grass-stalks have been cut away.

Fig. 2. As the nest appeared before the vegetation was removed.

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2

III.—THE PREDACEOUS ENEMIES OF ANTS

By J. Bequaert

The various means by which Nature prevents an excessive increase of the species not only forms in itself an interesting chapter of ecology, but its study is also of great importance in an understanding of the true meaning of Natural Selection. In the case of ants it has been contended that they are better defended than other insects against the attacks of predatory animals. Poulton[1] evidently takes this for granted when he considers that ants, together with wasps, are among the favorite models for "mimicking" insects and other arthropods. These ant-like arthropods, having acquired by Natural Selection their resemblance "to the aggressive, abundant, and well-defended ants," would according to this theory escape many of the attacks of their deceived and disgusted predaceous enemies. Though the evidence presented in the following pages is still very fragmentary, I trust the reader may easily conclude for himself to what extent such resemblances, which, in some cases at least, can hardly be doubted, have a real protective value. There is certainly little or no evidence to show that, as the theory is often expressed, ants are unpalatable to most insectivorous animals and are merely eaten accidentally or "during the time in which young birds or other animals are learning what to eat with impunity and what to reject."[2]

Another consideration of interest is the relative efficacy of parasitism and predatism in acting as a check on the reproductive power of the species. This point has been profusely discussed, and the argument has frequently been made that parasitism is in this respect of foremost importance. It must, however, be kept in mind, that, while we have been very completely and steadily informed of the activities of parasites, predatism has been much less investigated. It is not my intention to go further into this question; but I think a rather conservative view will be to consider that ecto- and endoparasites, while working all the time, though affecting only a small number of individuals at once, constitute a more regular check to the increase of the species. On the other hand, predatory enemies as a rule destroy large numbers of individuals at a time, but only at intervals. They are also apt to make their influence more felt when their prey for some reason or other suddenly multiplies on an exceptional scale. Professor Forel's aphorismic statement that "the most dangerous enemies of ants are always other ants, just as the worst enemies of man are other men," may be true in a general way for temperate regions, where ants are not superabundant and lead a rather inconspicuous life, but it can hardly be applied to the tropics. Ants, it is true, attract comparatively few of the predaceous arthropods, against which they are very effectively armed. They form, however, a considerable portion of the diet of many reptiles, amphibians, birds, and certain insect-eating mammals, some of these vertebrates being almost exclusively myrmecophagous. It may be further mentioned that many of these predaceous animals by no means confine their attacks to the smaller, more timid species of ants, but rather prefer the large-sized, powerfully defended members of the ponerine and doryline groups.

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[1] Poulton, E. B., 1908, 'Essays on evolution.' (Oxford), pp. 252–261. See also Jacobi, A., 1913, 'Mimikry und verwandte Erscheinungen.' (Braunschweig), pp. 95–114; Marshall, G. A. K., 1902, 'Five years' observations and experiments (1896–1901) on the bionomics of South African insects, chiefly directed to the investigation of mimicry and warning colors.' Trans. Ent. Soc. London, pp. 287–584, Pls. IX–XXIII; McAtee, W. L., 1912, 'The experimental method of testing the efficiency of warning and cryptic coloration in protecting animals from their enemies.' Proc. Acad. Nat. Sci. Philadelphia, pp. 281–364; Pocock, R. I., 1911, 'On the palatability of some British insects, with notes on the significance of mimetic resemblances.' Proc. Zool. Soc. London, II, pp. 809–868.

[2] H. C. McCook (1890, 'American spiders and their spinningwork,' II, pp. 357–365) has fully discussed the possibility of ant-mimicking spiders having arisen by means of Natural Selection, either to enable them to more readily obtain their food or to protect them from natural enemies.

The information contained in the following pages is based to a considerable extent upon examination of stomachs and pellets of predaceous animals in the wild state. I fully agree with Swynnerton that these sources of information are most valuable with regard to the general preferences of a predaceous animal, the insects it usually feeds upon and on which it for the most part "fills up." But I also believe with the same author that a knowledge of its detailed preferences must come in the main from continuous observation of individual wild animals and from special experiments both in nature and in captivity. The experimental method has been used with much skill and care by Swynnerton[1] to test the palatability of butterflies and its bearing on the efficiency of cryptic form and coloration. Miss A. H. Pritchett[2] has also published the results of a number of experiments with lizards and various insects, including ants, that possess protective, mimetic, and warning colors or that have some disagreeable characteristics which in a measure are supposed to prevent their being devoured by insect-eating animals. Such investigations with ants and their natural enemies should be extended and could not fail to add considerably to a better understanding of predatory habits.

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[1] Swynnerton, C. F. M., 1919, 'Experiments and observations bearing on the explanation of form and colouring, 1908–1913.' Journ. Linn. Soc. London, Zool., XXXIII, No. 224, pp. 203–385. See also Poulton, E. B., 'The experimental proof of the protective value of colour and markings in insects in reference to their vertebrate enemies.' Proc. Zool. Soc. London, 1887, pp. 191–274. Dahl, F., 1913, 'Vergleichende Physiologie und Morphologie der Spinnentiere unter besonderer Berücksichtigung der Lebensweise.' Jena, I, vi+113 pp. Heikertinger, F., 1919, 'Die metöke Myrmekoidie. Tatsachenmaterial zur Lösung des Mimikryproblems.' Biol. Zentralbl., XXXIX, pp. 65–102; Dahl, F., 1921, 'Täuschende Aehnlichkeit mit Bienen, Wespen und Ameisen.' Naturw. Wochenschr., N. F., XX, pp. 70–75.

[2] Pritchett, A. H., 1903, 'Some experiments in feeding lizards with protectively colored insects.' Biol. Bull., V, pp. 271–287.

ARTHROPODS

In the following account I shall consider only the arthropods which prey on ants without entering their nests; the nidal synechthrans, or carnivorous inmates of ant nests, are better studied in connection with true ant guests, though they may in some cases have been derived from outside marauders. Neither have the predaceous activities of ants towards other ants of the same or of different species been considered here.

Ants are comparatively immune from the attacks of predaceous arthropods, being themselves usually well provided against such enemies with offensive, defensive, or repulsive weapons. They nourish, however, a host of parasites and commensals belonging to almost every group of arachnids and insects, but these fall outside the scope of the present account. It must be admitted that, with the exception of certain of the most striking cases, such as ant-lions, but little attention has been paid to ant-hunting arthropods.

Arachnida

Ants do not often fall a prey to spiders and their relatives, except in the winged phases during the short period of the nuptial flight when large numbers of them perish in spider webs. The cautious ways of most worker ants make them a difficult game for terrestrial arachnids and in the larger forms the sting is an effective weapon against the attack of the soft-bodied spider. At one of the meetings of the Entomological Society of London, Poulton exhibited a spider and its prey taken at Itigi (former German East Africa) by Carpenter, the specimens being accompanied by the note: "Spider seen coming out of a nest of *Megaponera* bearing one feebly struggling, upside down in its fangs. Caught in a box the spider settled down to feed on the ant."[1] Poulton comments upon the remarkably small size of the spider as compared with its victim, which is one of the largest of African ponerine ants.

Certain terrestrial spiders of the Old World genus *Zodarion* Walckenær (=*Enyo* Audouin) are true ant hunters. "The *Zodarion*," says E. Simon,[2] "which I have observed in southern Europe, live at the expense of the ants and settle in their vicinity. They make neither snare nor web to stop their prey, but during their hunting hours they roam about the formicaries and mix with the long rows of ants, going from one to another and unexpectedly seizing feeble individuals, or such as are hurt or hampered by too heavy a burden. When the spider has caught its prey, it drags it aside, near its own abode; this is always surrounded by remains which leave no doubt as to the nature of its diet. These observations relate to *Z. elegans* and *nigriceps* E. Simon which, in southern France, Sardinia, and Corsica, live at the expense of the ants of the genus *Atta*" (=*Messor* Forel).

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[1] 1918, Trans. Ent. Soc. London, (1917), Proc. p. lx.

[2] 1893, 'Histoire naturelle des araignées'. (Paris), I, pt. 2, pp. 434-435. See also Simon, E., 1874, 'Les Arachnides de France.' (Paris), I, p. 242. van Hasselt, A., 1891, Tijdschr. v. Ent., XXXIV, pp. xxxv-xxxvi; Krausse, A., 1913, 'Eine Spinne (*Zodarion nigriceps* Sim.) an den Abfallplätzen der Ernteameisen auf Sardinien.' Arch. f. Naturg., LXXIX, A, Heft 9, pp. 66-67.

Many other terrestrial spiders are probably to some extent myrmecophags. Such is the case, for instance, with *Cœlotes atropos* Walckenær, which was observed in the act of capturing ants by Wasmann[1] in southern Germany. According to H. Lebert,[2] *Dysdera erythrina* Latreille, in Switzerland, constructs its tubular silk tent near ant hills, or sometimes even in the middle of ant nests, and plays great havoc with these insects.

E. Wasmann[3] and H. Schmitz[4] describe the skill with which the "gallows-spider" (*Theridion triste* Hahn) of western Europe preys upon the blood-red ant (*Formica sanguinea* Latreille) and related species. This spider spins no web, but lies in wait on a low plant for foraging worker ants: suddenly it drops from its lurking place on to an unsuspecting victim passing below. Then, quickly rendering the ant helpless by a few threads entwined around the body, the spider hoists its prey up to the plant as to a gallows and fastens it there. The sucked bodies of the ants are left hanging from the plant, either singly or in groups of two or three. Here again, there is a strange disproportion between the large and fierce worker ant and the small, soft-bodied, feebly armed spider.

Another European species, *Theridion riparium* (Blackwall), was observed by Henking[5] feeding chiefly on the workers of *Myrmica lævinodis* Nylander. This spider spins an irregular web between leaves and branches a short distance from the ground; in the middle of the web is woven a conical tent of silk, closed above, open below, and densely covered on the outside with bits of earth and remains of insects. A number of oblique or vertical sticky threads connect the whole structure with the ground and serve to entrap the ants. If a worker *Myrmica* happens to touch one of these snares with the antennæ or legs, its frantic efforts to get loose attract the attention of the spider hidden in her tent;

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[1] Quoted by van Hasselt, A., 1892, Tijdschr. v. Ent., XXXV, p. xxii. In the same periodical (1890, XXXIII, pp. 212–214), van Hasselt gives an account of European spiders associated with ants, including those that have been found inside formicaries.

[2] 1877, Neue Denkschr. Schweiz. Naturf. Ges., XXVII, Abth. 2, p. 33.

[3] 1898, 'Ameisenfang von *Theridium triste* Hahn,' Zool. Anzeiger, XXI, pp. 230–232.

[4] 1916, 'De Nederlandsche mieren en haar gasten,' Jaarb. 1915 Natuurh. Genootsch. Limburg, Maastricht, pp. 110–111 (of separate).

[5] Henking, H., 1886, 'Nahrungserwerb und Nestbau von *Theridium riparium* (Blackw.) Thor.,' Kosmos, XVIII, pp. 1–11.

she at once rushes to the thread pulled by the ant and tries to drag her intended victim into the air; if the ant succeeds in holding fast to the soil, the spider runs down the thread, throws some additional silk on her prey, which sooner or later loses its grip and is then quickly dragged up and entangled in the irregular maze above.

In his account of the agricultural ant of Texas, H. C. McCook[1] writes:

> The only other natural enemies of [*Pogonomyrmex*] *barbatus*, so far as observation has yet determined, are the spiders. There is a large theridioid (*Theridion lineamentum* McCook = *T. lineatum* Hentz) who is especially destructive of these ants. I found her nest established upon the grass-grown disks in the following manner: several stalks of the *Aristida* were bent over near the top, or midway of the spire, and firmly bound together by silken cords. Within this tent and just below the apex, the strong snare of right lines (retitelarian) was fixed, in the midst of which the spider hung in the usual inverted position. The ants are constantly climbing the grass-stalks for purposes which I could not divine. . . . They thus become entangled in the snare and fall victims to the watchful aranean. It is not impossible that the spider, whose snare sometimes hung quite near the ground, swings down and seizes the ants as they pass through the tent. Their dry shells might be seen clinging to the threads, or the yet warm bodies trussed up and swathed for food. Under one of these tents I picked up a small ball of six or eight ant skeletons rolled up and tied together just as they had been cast out of the snare.

Coleoptera

One might expect that certain of the predaceous members of this order, both larval and adult, occasionally capture ants, though this kind of prey is often carefully avoided. Adult tiger-beetles (Cicindelidæ) have been seen catching ants. Wasmann[2] mentions the fact that in the vicinity of Pará, Brazil, the columns of the leaf-cutting saúba-ant (*Atta sexdens*) are often attacked by *Megacephala* (*Tetracha*) *rutilans* J. Thomson. Chitty, in England, observed *Cicindela campestris* holding a *Myrmica rubra* in its jaws:

> I thought the ant was struggling, for it was alternately right inside the mouth of the beetle and then nearly out, but I think this was really the mode adopted by the beetle in devouring its food. Finally the mesothorax and spiny metathorax were ejected from the mouth and also the shell of the abdomen, which had been sucked empty. The rest of the ant was apparently consumed, but possibly it was only the contents of the abdomen that were really eaten.

The larvæ of the tiger-beetles are very voracious and fierce. They live in deep, tube-like holes which they burrow more or less vertically into the ground; the hole is blocked, a short distance below the entrance, by the strongly chitinized, horizontal upper surface of the enlarged head and prothorax. If a spider or insect drops into the burrow and comes in contact with this plate, with a reflex motion the larva's head automatically jerks back, throwing the prospective prey against the walls of the tube. Thus stunned the victim is easily seized by the larva's long, sharp jaws, dragged to the bottom of the burrow and sucked out. From published data it would seem that the exact nature of the food of these larvæ has been but little investigated. In his interesting account of the life-histories and larval habits of *Cicindela*, V. E. Shelford[1] writes: "The food of the larvæ consists of land crustacea, centipedes, spiders, dragonflies, butterflies, flies, beetles, and larvæ of all sorts, in fact any small animal that comes within reach." Because of their inquisitiveness, terrestrial ants must frequently enter the burrows of cicindelid larvæ. In a recent publication, Stäger[2] concludes from his feeding experiments with *Cicindela* larvæ kept in glass tubes, that ants which drop into the burrows are merely stunned, killed and hurled out without being sucked dry, so that they can not be regarded as part of the diet of these larvæ but rather as their most dangerous enemies.

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[1] 1879. 'The natural history of the agricultural ant of Texas.' (Philadelphia) p. 203.

[2] Quoted by Horn, W., 1908. Genera Insectorum Fasc. Carabidæ, Subfamily Cicindelinæ, p. 10.

[3] Chitty, A. J., 1904. *Cicindela campestris* feeding on *Myrmica rubra*. Ent. Record XVI, p. 206.

Neuroptera

Perhaps the best known ant enemies among insects are the ant-lions or certain members of the genus *Myrmeleon*. The larvæ of these Neuroptera secure their prey by means of funnel-shaped pitfalls which they excavate in sheltered places in dry, loose soil. The size of these funnels varies with that of the larvæ and the nature of the soil, and may be a few millimeters to 10 or 12 cm. across, the depth being about half the diameter.

The interesting habits of the common European species, *Myrmeleon formicaleo* (Linnæus) (=*formicarius* Linnæus) were first accurately described by Réaumur and have since been frequently studied. The larva buries itself at the bottom of the pit, only the upper part of the head and the elongate, widely extended jaws projecting out of the dust. Thus ambuscaded, it remains motionless, sometimes for hours, until a wandering insect runs over the edge of the funnel and either tumbles down at once into the jaws of the waiting ant-lion or slides only a short way and then attempts to crawl up and out of the pit. In the latter case, however, the soft, loose soil on the slope readily yields beneath the legs of the struggling insect and rolls down on the ant-lion larva, which at once forcefully throws dust with its head. At one time it was believed that these particles were aimed at the victim, but as a matter of fact they are flung out of the pit. In this way the ant-lion merely deepens its funnel, the steep walls then crumbling down under their own weight, carrying the unfortunate insect with them into the jaws of the larva. The mandibles and maxillæ of the latter act together as sucking jaws; their tips are thrust into the body of the captive and do not loosen their grip until it has been emptied of its liquid contents, when the corpse is hurled out of the hole. Any insect that happens to drop into the pitfalls is taken by the ant-lions, but ants are most likely to do so and many sucked-out bodies of these insects are usually found near the pits.[1]

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[1] 1908, Journ. Linn. Soc. London, Zool., XXX, No. 197, p. 178.

[2] Stäger, R., 1918, 'Biologische Beobachtungen an der Cicindelen-Larve,' Mitt. Naturf. Ges. Bern, (1917), pp. 22–44.

The other genera of the family Myrmeleonidæ also have predaceous larvæ, but, so far as known, they do not dig pits and apparently hunt in the open, their prey consisting chiefly of plant-lice and other soft-bodied insects.

Diptera

It is most interesting that, in the dipterous family Leptidæ, the larvæ of certain genera have acquired the behavior and some of the structural peculiarities of the ant-lions. These belong to the genera *Vermileo* and *Lampromyia*, while the other members of the family possess free-living predaceous larvæ. The best studied case is that of *Vermileo vermileo* (De Geer) (= *V. degeeri* Macquart), of southern Europe, the "ver-lion" of Réaumur, very completely described and figured by both this naturalist and De Geer, about the middle of the eighteenth century.[2] The larva of this fly hides at the bottom of a funnel-shaped pitfall after the manner of the ant-lion; it is a vermicular maggot, which buries and fixes itself in the loose sand by means of four digitate processes, armed with stiff, hooked bristles, at the end of its anal segment; and by means of supplementary stiff bristles on some of the posterior rings. The four anterior segments are slender and fimbriate on the sides; they can be curved against a ventral projection of the fifth segment so as to form a loop, with which the larva throws out the dust while burrowing its pitfall. When a small insect, usually an ant, drops into the pit it is seized and firmly held by the loop around the thorax or behind the head, the loop thus taking the place of the ant-lion's jaws. Many years ago a similar funnel-burrowing fly larva was discovered by Prof. J. H. Comstock in the Sierra Nevada, California, but could not be reared to the adult stage. Prof. W. M. Wheeler has recently been more successful in obtaining the flies of these larvæ, thus adding a second, North American species to the genus *Vermileo.*[1] He states that the larva is in behavior and structure very similar to that of *V. vermileo*, and that it also traps in its pitfalls small insects, especially ants.

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[1] Réaumur, 1742, 'Mémoires pour servir à l'histoire des Insectes,' VI, pp. 333–386, Pls. XXXII–XXXIV. See also Doflein, F., 1916, 'Der Ameisenlöwe,' Jena, 138 pp., 10 Pls.; Navás, L., 'Algunas costumbres de las hormigas y hormigaleones.' Actas Soc. Españ. Hist. Nat., 1909, pp. 218–222. Meissner, O., 1911, 'Ameisen und Ameisenlöwen. Ein Beitrag zur Ameisenpsychologie,' Societas Entomologica, XXVI, pp. 59–60.

[2] De Geer, 1752, Act. Ac. Sci. Suec., p. 180, Pl. v; 1776, 'Histoire des Insectes,' VI, p. 168, Pl. x. Réaumur, 'Histoire du Ver Lion.' Mém. Ac. Sci. Paris, 1753, pp. 402–419, Pl. xvii. Brauer (1883, Denkschr. Ak. Wiss. Wien, math.-naturw. Kl., XLVII, Abt. 1, pp. 43–44, Pl. iv, figs. 84 and 85) gives an accurate description and drawing of this larva. The earliest reference to the habits of *Vermileo* is by an anonymous writer in Histoire Ac. Sci. Paris (1706), 1731, pp. 7–8, where it is called *Formica-vulpes*.

The adults of the allied genus *Lampromyia* are very distinct in their greatly lengthened, slender, stiff proboscis, but the larvæ differ only in minor details from those of *Vermileo.* P. Marchal[2] has written an interesting paper on the habits of *Lampromyia pallida* Macquart (=*L. miki* Marchal), of which he discovered the funnel-burrowing larvæ near Tunis. Three other species have been described in this genus: *L. cylindrica* (Fabricius) from Northern Africa and Spain, *L. canariensis* Macquart from the Canary Islands, and *L. sericea* Westwood from Damaraland. During my stay at Algiers in June 1910, I had the good fortune to observe rather closely the larvæ of a species of this genus, probably *L. pallida*. They were found in numbers on the outskirts of Mustapha Supérieur, along the highway to Blidah, in the suburb of Colonne Voirol. Wherever the soft sandstones of the road banks happened to be excavated or weathered into miniature caves, one was sure to find the dry, powdery dust beneath the shelter of the overhanging rock fairly dotted with the funneled pits of *Lampromyia*. At that season adult flies were frequently seen resting on the rocky ceilings of the excavations. I found that the most common victims of these larvæ were workers of the little *Tapinoma erraticum* (Latreille).

Robber-flies (Asilidæ) are occasionally observed sucking the juices of winged ants, but I am not aware that they ever attack the workers.

Certain tropical muscid flies of the genus *Bengalia* have developed predaceous habits quite unique among the calyptrate Muscoidea; they are frequently found on roads and in clearings hunting for soft-bodied insects after the well-known manner of robber-flies. Attention was first called to these peculiar habits by Nangle[3] in India and E. E. Green[4] in Ceylon; in both cases the flies, *Bengalia obscurepennis* (Bigot), were hunting winged termites flying at night. J. W. Yerbury saw the same species "trying to take her burden from a large ant (*Lobopelta* species)." F. W. Thomson made the following observation with regard to the Indian *B. jejuna* (Fabricius): "I always noticed specimens of this species on the ground, or on a stone or leaf near an ant's nest. On watching, I saw them swoop down on any ant carrying an 'egg' or larva, take it from the ant, carry it away a short distance and proceed to suck it."[1] *Bengalia latro* de Meijere, in Java, lurks in the neighborhood of the columns of *Pheidologeton diversus* (Jerdon); when a worker ant comes along carrying its prey, the fly dashes into the moving ant column, quickly steals the prey from the carrier, and returns to its perch where it devours its catch at leisure.[2] Lastly, G. R. Dutt, in his entertaining 'Life Histories of Indian Insects,'[3] writes of *Monomorium indicum* Forel as follows: "One morning I observed the inmates of a nest marching out with young ones. Close to the nest was sitting a muscid fly (*Ochromyia* species) which attacked from time to time the larvæ and pupæ that were being carried by the workers. The fly never snatched the victim from the grasp of the ant, but simply 'licked' it from its place with the proboscis, which when withdrawn left the larva or pupa quite shrivelled up."

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[1] Wheeler, W. M., 1918, '*Vermileo comstocki*, new species, an interesting leptid fly from California.' Proc. New England Zool. Club, VI, pp. 83–84.

[2] Marchal, P., 1897, 'Notes d'entomologie biologique sur une excursion en Algérie et en Tunisie. *Lampromyia Miki*, nov. species. Cécidies.' Mém. Soc. Zool. France, X, pp. 5–25, Pl. I.

[3] 1905, Journ. Bombay Nat. Hist. Soc., XVI, No. 4, p. 747.

[4] 1906, Spolia Zeylanica, III, p. 220. 1907, ibid., IV, pp. 183–184 (the fly is here called *Ochromyia jejuna* F.). Poulton, Trans. Ent. Soc. London, 1906, p. 394

The African *Bengaliæ* evidently have much the same habits as their Indian congeners. According to W. A. Lamborn,[4] *Bengalia depressa* (Walker), in Southern Nigeria, regularly follows the marauding armies of *Dorylus nigricans*, to rob them of their prey. On one occasion the whole performance was closely watched and described as follows:

> I soon saw three or four of the muscids flying about the moving column and occasionally settling near it, sometimes on the ground quite close to the ants, sometimes on a blade of grass, stone or other raised object. Such as settled on the ground were extremely alert, and being able to run rapidly, never allowed any ants to approach any nearer to them than about a quarter of an inch. When, as frequently happened, any ant made a little circuit away from the main body, a fly would generally pursue it at a distance of about half an inch, but backing away directly the ant turned towards it. Other flies, having rested motionless a few minutes, flew up and poised themselves on the wing over the ants, but, immediately the drivers realized their presence and stretched out towards them with widely opened mandibles, flew again to a place of rest. Eventually I saw a muscid stalking a minor ant which had strayed from the main body carrying a pupa in its jaws. Suddenly the fly rushed forward, and it must have driven its proboscis, which seems to me armed with strong bristles, into the pupa, for the ant was brought to a standstill with a sharp jerk. Then ensued

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[1] Observations recorded by Poulton, 1914, Trans. Ent. Soc. London, 1913, Proc., pp. cxxviii–cxxix.

[2] Jacobson, E. 1910. '*Pheidologeton diversus* Jerdon und eine myrmecophile Fliegenart.' Tijdschr. v. Ent., LIII, pp. 328–335. Meijere, J. C. H. de. 1910. 'Ueber die von Jacobson auf Java bei *Pheidologeton diversus* Jerdon beobachtete Fliegen,' ibid., LIII, pp. 336–340.

[3] 1912, Mem. Dept. Agric. India, Ent. Ser., IV, No. 4, p. 251.

[4] 1914, Trans. Ent. Soc. London, (1913), Proc., pp. cxxv–cxxviii.

a tug-of-war between ant and fly fastened on at opposite ends of the pupa, but neither had the advantage till, as it seemed to me, the ant must have got annoyed and loosening its hold rushed towards the fly, which of course instantly flew off with the pupa, and this it proceeded to suck on the ground about a foot away from the ants. It allowed me to get quite close before taking to the wing with its prey, and it settled again two or three feet further off and became so preoccupied with its meal that it fell an easy victim to my net. I then carefully watched a fly hovering over the ant column. It suddenly swooped down and rose instantly with an ant pupa, with the driver that had been carrying it still hanging on, fixed to its proboscis. The fly carried this burden for about a foot, then dropped it and alighted on the ground near by. The ant started to run away with the pupa, but the fly pursued it, again impaled the pupa and started a tug-of-war with the ant. Neither side had any advantage, and then the fly rose again about three feet into the air with the pupa and ant and after a flight of about eighteen inches let them fall. The ant being discomposed by this procedure let go of the pupa, and no sooner had it done so than the fly seized it and, flying off with it triumphantly, settled near by and proceeded as in the previous case to suck the prey. This one again fell easily to my net, so that the flies are evidently keenly alert only when in the immediate vicinity of the ants. I subsequently noticed that the Diptera seemed to have certain preferences in regard to their prey, for I repeatedly noticed one poised over the ant column make an unsuccessful swoop and then fly, keeping level with the ant carrying the particular object which it had missed, making occasional rushes in an endeavor to secure it. Those I took had obtained ant pupæ, but I am sure they take other things from the drivers, probably portions of dead insects.

Further observations by Lamborn[1] in East Africa have shown that the Dorylinæ are by no means the only species of ants favored by the attentions of the African *Bengaliæ*. At Lindi, former German East Africa, a female *B. peuhi* Brauer and v. Bergenstamm was observed alighting near a column of *Crematogaster castanea* Smith which was passing up and down a baobab tree; the fly made various attempts to rob some of the ants of their food, tiny fragments of beetles; it was very alert, retiring immediately when any stray ant happened to come its way. *Bengalia gaillardi* Surcouf was seen in the same locality stealing food carried to the nest by workers of *Pheidole liengmei* Forel, *Camponotus* species, *Leptogenys stuhlmanni* Mayr, *Prenolepis longicornis* (Latreille), etc.; at Daressalaam this fly was watching for similar purposes the home-coming *Plagiolepis custodiens* (F. Smith).

The genus *Bengalia* is restricted to the Old World tropics and belongs in the Calliphorinæ. It differs conspicuously from the other members of this group in the structure of the proboscis, which is rigid, chitinized, strongly toothed at the apex, directed forward, and evidently adapted to its predaceous habits.[1] *Bengalia gaillardi* Surcouf was observed by Gaillard at Koulouba, French Sudan, preying upon termites in a rotten tree stump which had been freshly dug up.[2] G. D. Carpenter[3] saw *Bengalia depressa* Walker sucking the juices from a winged termite, at Kilindini, British East Africa.

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[1] 1920, Trans. Ent. Soc. London, (1919), Proc., pp. lii-lviii.

Several species of *Bengalia* are commonly found in the Belgian Congo, along paths and roadsides, hunting for various insects. On June 4, 1915, I caught a number of *B. spurca* Brauer and v. Bergenstamm and *B. floccosa* van der Wulp[4] near a column of driver ants in a forest gallery at Thysville; the female flies would hover over the moving army close to the ants and seize the prey or pupæ carried by the workers, as described above by Lamborn.[5]

Some other Diptera also follow the columns of driver ants, but apparently for purposes very different from those of *Bengalia*. In his account of the foraging *Eciton* of the Amazon, H. W. Bates has this interesting passage.[6]

> The armies of all *Ecitons* are accompanied by small swarms of a kind of two-winged fly, the females of which have a very long ovipositor, and which belongs to the genus *Stylogaster* (family Conopsidæ). These swarms hover with rapidly vibrating wings, at a height of a foot or less from the soil, and occasionally one of the flies darts with great quickness towards the ground. I found they were not occupied in transfixing ants, although they have a long needle-shaped proboscis, which suggests that conclusion, but most probably in depositing their eggs in the soft bodies of insects, which the ants were driving away from their hiding-places. These eggs would hatch after the ants had placed their booty in their hive as food for their young. If this supposition be correct, the *Stylogaster* would offer a case of parasitism of quite a novel kind.

Similar observations were made some years later by C. H. T. Townsend in the State of Vera Cruz, Mexico. Under the heading *Stylogaster*, this author writes:[7]

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[1] See Green, E. E., Trans. Ent. Soc. London, 1908, Proc., pp. xxvi–xxvii. Bezzi, M. 1913, 'Einige Bemerkungen über die Dipterengattungen *Auchmeromyia* und *Bengalia*,' Ent. Mitt. Deutsch. Ent. Mus. Berlin, II, pp. 70–78. Cragg, F. W., 1918, 'The mouth-parts of *Ochromyia jejuna*, a predaceous muscid,' Indian Journ. Med. Res., V, pp. 516–522, Pl. XLVIII. Roubaud, E., 1914, 'Études faune parasitaire Afrique Occ. Française,' I, p. 33, fig. 7B.

[2] Surcouf, J., Bull. Mus. Hist. Nat. Paris, 1912, p. 427.

[3] 1920, Trans. Ent. Soc. London, (1919), Proc., p. lviii.

[4] Identified by Dr. J. Villeneuve.

[5] It may be noted that the first stages of *Bengalia* are unknown. A subcutaneous maggot which bores into the skin of man and various animals in South and Central Africa [*Cordylobia anthropophaga* (Grünberg)], has been wrongly identified as belonging to *Bengalia depressa* (Walker) and this error has been repeatedly copied. As stated by Austen (Trans. Ent. Soc. London, 1907, Proc., pp. xlii–xlviii), there is no evidence whatever to show that the larva of the true *B. depressa* is a subcutaneous parasite.

[6] 1863, 'The naturalist on the River Amazon,' II, pp. 365–366. Bates' observations on this fly have been strangely misunderstood by later authors. Brauer apparently first makes the statement that, according to Bates, *Stylogaster* "verfolgt mit ihrer Legeröhre Termiten" (1883, Denkschr. Ak. Wiss. Wien math. naturw. Kl., XLVII, p. 84). This erroneous conception is unfortunately repeated by Williston (1885, Trans. Connecticut Ac. Arts Sci., VI, p. 380), by de Meijere (1904, Tijdschr., v. Ent., XLVI (1903), p. 151), and again by Kröber (1919, Arch. f. Naturg., LXXXIII, (1917), Abt. A, Heft 8, p. 111). There is not the slightest evidence at hand to show that *Stylogaster* is associated with termites.

[7] 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 23.

Fifty-one specimens of this interesting genus were taken hovering over the front ranks of a moving army of ants, in a *cafetal* at Paso de Telayo, during the last hour or two of daylight on March 29. In company with them were numerous specimens of *Hyalomyia* and some other small tachinids. The ants have been determined by Mr. Theo. Pergande as *Eciton foreli*, Mayr. . .[1] The column of ants was about 15 feet wide and 25 feet long, and moved slowly but surely in a straight line through the *cafetal*, swarming rapidly over the thick covering of dead leaves, branches, and other obstructions that strewed the ground under the coffee-trees. The specimens of *Stylogaster* hovered continually over the ants, now and again darting at them, without doubt for the purpose of ovipositing in their bodies. During the whole three months of my collecting in this locality, I saw not a single specimen of *Stylogaster* at any other time, but on this occasion, during the short time that I had before dark overtook me, I succeeded in capturing fifty-one specimens, by sweeping closely with the net over the front ranks of the ants.

From the accounts quoted above it is evident that both Bates and Townsend base their conclusions on mere surmises, since neither of them has succeeded in finding the eggs. Their observations merely show that *Stylogaster* is in some way associated with the columns of driver ants, though it is by no means certain that this is true for all the members of the genus. Some of the North American species are found as far north as Illinois and New York, in regions where foraging ants are altogether absent. Yet it is possible that the African species of *Stylogaster* are associated with the columns of the Dorylinæ.[2] G. D. H. Carpenter, in Uganda, in his description of the frantic efforts made by cockroaches to escape from the columns of *Dorylus*, remarks: "I twice saw, hovering over these cockroaches, and occasionally suddenly pouncing down (apparently for the purpose of ovipositing) several of a small long-bodied insect—it might have been a dipteron or an ichneumon, but the hovering and darting flight suggested rather a syrphid. It was so extraordinarily active that I failed to catch it."[3]

In a recent account of his observations on army ants in British Guiana, Wheeler[4] observes that although he saw *Stylogaster* on several occasions accompanying the advancing armies of *Eciton burchellii* and darting at the ants or even at open spaces on the ground, there was nothing to convince him that these flies were ovipositing. Once he came upon a swarm of both sexes of *Stylogaster* hovering above a spot where there were no *Ecitons*, although a few workers of *Gigantiops destructor* and *Ectatomma ruidum* were running about in the vicinity. "This observation," he says, "and the fact that some species of *Stylogaster* occur in North America north of the range of *Eciton*, make it seem doubtful whether these flies are as intimately attached to the ants as some authors have supposed. They are, perhaps, attracted by the rank odor of the *Ecitons*."

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[1] According to Wheeler, a synonym of *Eciton burchellii* Westwood.

[2] Dr. H. Brauns, of Willowmore, wrote me recently as follows: "*Stylogaster* habe ich seiner Zeit einige Male in Westafrika (Cameroon, Gaboon) beobachtet. Die Thiere fielen mir dadurch auf, dass sie wie Falken über *Anomma* Zügen schwebten. In welchem Zusammenhang sie mit den Doryliden stehen, weiss ich nicht. Dass sie ihre Eier auf dem Raube von Doryliden, der diese mit sich schleppen, ablegen sollten ist kaum anzunehmen, da dieser alsbald verzehrt oder verfüttert wird." (Letter of June 5, 1920.) I have collected one of the North American species (*Stylogaster neglecta* Williston) on flowers of *Clethra alnifolia*, *Monarda fistulosa*, *Helianthus strumosus* and *Eupatorium purpureum*.

[3] 1915, Trans. Ent. Soc. London, (1914), Proc., pp. cviii–cix.

[4] 1921, Proc. American Ac. Arts Sci., Boston, LVI, p. 296.

Hymenoptera

The following four species of Sphegoidea are the only ones known to provision their nests with ants. It is somewhat surprising that so few predaceous wasps have developed a liking for this kind of prey.

1.—*Tracheloides quinquenotatus* (Jurine) (=*Crossocerus luteicollis* Lepeletier and Brullé; *Fertonius formicarius* Ferton). This remarkable little wasp is apparently distributed over the entire Mediterranean subregion. Its curious habits were first observed by Ferton[1] in Algeria. It preys there on the workers of *Tapinoma erraticum* (Latreille), storing forty to fifty paralyzed ants in each cell; the nest is placed in crevices in walls or burrowed to a slight depth in sandy soil. I have frequently observed its hunting behavior in the vicinity of Algiers (June 1910) in the same locality in which I found the pitfalls of *Lampromyia* described above. The females were hovering over the foraging files of *Tapinoma erraticum* and would suddenly pounce on one of the ants, seldom missing their aim.

Similar habits were described for this species by Ferton[2] in Corsica, where also it preys on *Tapinoma erraticum*. Bignell[3] likewise found *quinquenotatus* there, taking small ants which were travelling in a continuous stream across the road.

2.—*Tracheloides curvitarsis* (Herrich-Schæffer) is only known from southern Germany, Italy and Austria. Emery[4] observed this wasp near Portici and Bologna, Italy, storing about forty partly paralyzed workers of *Liometopum microcephalum* (Panzer) in each of its cells which were located in abandoned beetle borings in a tree.

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[1] Under the designation *Fertonius luteicollis*: Ferton, C., 1890, 'Un Hyménoptère ravisseur de fourmis,' Actes Soc. Linn. Bordeaux, XLIV, pp. 341–346.

[2] Under the designation *Fertonius formicarius*: Ferton, C., 1895, 'Nouveaux Hyménoptères fouisseurs et observations sur l'instinct de quelques espèces,' Actes Soc. Linn. Bordeaux, XLVIII, pp. 261–272. Under that of *Brachymerus quinquenotatus*: Ferton, C., 1901, 'Notes détachées sur l'instinct des Hyménoptères mellifères et ravisseurs (1ère série),' Ann. Soc. Ent. France, LXX, pp. 83–148, Pls. i–iii.

[3] Bignell, G. C., 1900, '*Crabro 5-signatus*, Jurine, carrying off ants in Corsica,' Ent. Monthly Mag., XXXVI, p. 264.

[4] Emery, C., 1891, 'Zur Biologie der Ameisen,' Biol. Centralbl., XI, pp. 165–180. 1893, 'Sur un Crabronide chasseur de fourmis,' Ann. Soc. Ent. France, LXII, Bull., pp. lxiii–lxiv.

Tracheloides Aug. Morawitz (of which *Brachymerus* Dahlbom and *Fertonius* Pérez are synonyms) is regarded by Kohl in his able Monograph of the Palearctic Crabroninæ[1] as a species-group or subgenus of *Crabro* Fabricius. Only the two species mentioned above are known; they possess a large, much thickened head, with the face strikingly broad below, a peculiarity evidently adapted to their ant-hunting habits, since it makes the jaws with which they seize the ants much more powerful than is usual among species of *Crabro*. Indeed, most other members of this extensive genus prey on rather soft-bodied and harmless insects, chiefly Diptera.

3.—*Aphilanthops taurulus* Cockerell. Ainslie[2] found this philanthid wasp preying on the workers of *Pogonomyrmex barbatus* subspecies *rugosus* Emery in New Mexico.

4.—*Aphilanthops frigidus* (F. Smith). This interesting species of eastern North America has been very completely investigated by Wheeler[3] near Boston. Curiously enough, it selects only fertile females, or queens, of ants to provision its nests and seems to restrict its attacks to various species of the genus *Formica* (*Formica fusca* Linnæus and its variety *subsericea* Say; *F. pallidefulva* Latreille subspecies *nitidiventris* Emery; and *F. neogagates* Emery). It forms colonies of from thirty to sixty nests, located in open patches, roads or clearings in woods. The burrow descends with a very steep slope to a depth of six to eight inches, where it terminates in a small cell, there being two or three other cells on the sides. The *Formica* queens are captured during the short time of their nuptial flight, before they have lost their wings, and are merely stung and paralyzed. The wasp does not mutilate or malaxate her victims, which still move their palpi, legs, and antennæ either spontaneously or when touched, for several hours or even for a few days after they have been captured and placed in the nest. The wasp carries the ant under her body, supporting it by means of her middle and hind legs and holding its antennæ in her mandibles. Having dragged the ant a few inches into the burrow, she proceeds to cut off its wings, usually very neatly, although the stubs she leaves attached to the body are a little longer than in queen ants that have deälated themselves; more rarely the wasp simply gnaws off the tips or apical halves of the wings. Wheeler believes that each female *Aphilanthops* secures several queen ants, usually five to seven, often belonging to more than one species, and stores them in two or three cells, from which they are taken as needed to feed a single larva. "The egg is evidently laid on an isolated ant which the mother wasp cuts in two in order that the larva may gain access to the nutritious contents of the thorax and gaster. Then the other ants are taken from storage and brought to the larva one by one as they are required, till all are consumed and the larva is ready to pupate."

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[1] Kohl, F. F., 1915, 'Die Crabronen der palaarktischen Region,' Ann. Naturh. Hofmus. Wien, XXIX, pp. 1–453, Pls. I–XIV.

[2] Ainslie, C. N., 1909, 'A note on the habits of *Aphilanthops*,' Canadian Ent., XLI, pp. 99–100.

[3] Wheeler, W. M., 1913, 'A solitary wasp (*Aphilanthops frigidus* F. Smith) that provisions its nest with queen ants,' Journ. Animal Behavior, III, pp. 374–487.

Aphilanthops Patton is a strictly Nearctic genus of fossorial wasps, of which eleven species have been described, mostly of the western United States. It is highly probable that all will prove to be ant hunters, and an interesting field of study is here open to the myrmecologist [1]

The prey of *Polybia scutellaris* (White), a social wasp of southern Brazil, consists mainly of winged termites, which are stored whole in the nest, often by the hundreds; but occasionally this wasp collects winged male ants too. In one case about a hundred males of *Dorymyrmex pyramicus* (Roger) and a few other male ants were found in its nest.[2]

AMPHIBIANS[3]

The diet of many amphibians consists almost exclusively of various arthropods. Only living and moving prey is devoured; dead or motionless food has little or no attraction for them. In the frogs and toads the tongue, attached in front and free behind, is often the chief organ used in seizing the food, being thrown out with lightning-like rapidity; it is soft, extensile, coated with a glutinous secretion, and adheres firmly to the prey, which is swallowed whole. The teeth, when present, are used only for catching and holding the prey; they are absent in many genera. Digestion is very rapid. The American toad, *Bufo americanus* Holbrook, for instance, feeds continuously throughout the night, except when food is unusually plentiful; in twenty-four hours it consumes a quantity of insects equal to about four times its stomach capacity. In other words, the toad's stomach is practically filled and emptied four times in each twenty-four hours.[4]

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[1] The species of the genus *Microbembex* store dead insects in their nests, a very unusual procedure among predaceous wasps; they can occasionally be seen collecting dead ants that have been thrown out at the entrance of ant nests. See Parker, J. B., 1917, Proc. U. S. Nat. Mus., LII, pp. 134–141.

[2] Wasmann, E., 1897, 'Beutethiere von *Polybia scutellaris* (White) Sauss.,' Zool. Anzeiger, XX, pp. 276–279.

[3] I am under great obligation to Mr. C. L. Camp for valuable suggestions on the subject of ants as food of batrachians and reptiles.

[4] Kirkland, A. H., 1904, 'Usefulness of the American toad,' U. S. Dept. Agric. Farmers' Bull. No. 196, p. 6; reprinted with changes from Bull. 46, Hatch Exp. Stat. Amherst, Mass., 1897, pp. 1–30, Pl. II. See also Ritchie, A. S., 1869, 'The toad as an entomologist,' Canadian Naturalist, N. S., IV, pp. 174–178. Garman, H., 1901, 'The food of the toad,' Kentucky Agric. Exp. Stat. Bull. 91. Hodge, C. F., 1898, 'The common toad,' Worcester, Mass. Storer, T. I., 1914, 'The California toad. An economic asset,' Univ. California Journ. Agric., II, pp. 89–91; Muns, P. A., 1920, 'A Study of the food habits of the Ithacan species of Anura during transformation,' Pomona Journ. Ent. Zool., XII, pp. 33–56.

Toads and frogs being more often seen while in search of good, the stomach contents of specimens in collections are frequently little or not at all digested and can then be easily identified; many insects with hidden habits may thus be obtained. Amphibians are in this respect of very great help to the collector of ants.

Numerical data relating to the food of these animals has not often been published, even for the species of temperate regions. Perhaps the most complete records of the kind are those in H. A. Surface's 'Report on the economic features of the amphibians of Pennsylvania.'[1] From this paper it may be seen that, while almost all salamanders, toads, tree-frogs, and frogs occasionally eat ants, these insects constitute an important item in the diet of certain species.

Food of Certain Amphibians in Pennsylvania (Surface)

	Number of Stomachs with Recognizable Food	Number of Specimens Eaten	Number of Ants	Percentage of Ants
Plethodon cinereus (Green)	260	583	182	30
" *glutinosus* (Green)	125	367	63	17
Desmognathus fusca (Rafinesque)	235	378	33	8
Bufo americanus Holbrook	52	150	20	13

Kirkland's paper referred to above contains the result of an examination of 149 stomachs of toads (*Bufo americanus* Holbrook) in Massachusetts; in this case 19 per cent of the total contents were ants; the percentage was higher in May, when ants formed 23 per cent of the food and were present in 70 per cent of the stomachs.

The Texan robber frog, *Eleutherodactylus latrans* (Cope), a land animal of secretive and nocturnal habits, probably feeds extensively on ants. J. K. Strecker[2] mentions that "the stomach of one example contained the elytra of a ground beetle and the remains of many spiders and ants."

True frogs of the genus *Rana* take very few or no ants, at least in North America, though, as may be seen below, the stomachs of certain of the African species contain a fair proportion of these insects, mostly in the winged phases. Surface, in Pennsylvania, found few or no ants in *Rana*, and this result is confirmed by C. J. Drake's very extensive study of the food of the leopard frog (*Rana pipiens* Schreber) in Ohio;[1] of 209 stomachs examined only 19 contained one or two specimens of ants (about 2.5 per cent of the total animal food). J. C. Needham obtained similar results with the bullfrog (*Rana catesbiana* Shaw) in New York State; in the stomachs were found only a few remains of the winged males and females of *Camponotus pennsylvanicus*, which evidently had dropped on the surface of the water, where they were taken by the frogs.[2]

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[1] 1913, Zool Bull Div Zool Pennsylvania Dept Agric., III, Nos. 3 and 4, pp. 134-147.

[2] 1910, Trans. Ac. Sci. St. Louis, XIX, No. 5, p. 82.

In his paper on Nicaraguan amphibians, G. K. Noble[3] mentions ants among the stomach contents of the following species.

Dendrobates tinctorius (Schneider). The stomachs of two specimens "contained mostly ants, although a few beetles and other insects were present. There were about fifty ants in each stomach. Dr. Wheeler has identified most of these as *Wasmannia auropunctata* Roger. Seven other genera were represented, but each by only a few workers: *Strumigenys*, 2 species; *Rhopalothrix*, new species; *Leptogenys* (*Lobopelta*), species; *Trachymyrmex*, species; *Ponera*, species; *Pheidole*, 2 species; and *Solenopsis*, species." (*op. cit.*, p. 322).

Dendrobates typographus Keferstein. The stomachs examined contained "mostly small red ants." (*op. cit.*, p. 323).

Eleutherodactylus polyptychus (Cope). The stomachs "contained only insects and mostly large ants." (*op. cit.*, p. 329).

Eleutherodactylus rugosus (Peters). "One medium-sized individual contained in its stomach two beetles and a large ant, *Neoponera obscuricornis* (Emery)." (*op. cit.*, p. 331).

Bufo hæmatiticus Cope. "It had been feasting on ants. Its stomach contained a great many large red and black ones. The following species were represented in the contents of this single stomach: *Pachycondyla harpax* F. (4), *Ectatomma ruidum* Rog. (1), *Eciton hamatum* F. (3), *Atta cephalotes* (4), *Apterostigma* species (1)." (*op. cit.*, p. 333).

Bufo coniferus Cope. "A few ants contained in one stomach belonged to *Paraponera clavata* F., *Neoponera obscuricornis* Em., *Apterostigma* species and *Hylomyrma* species." (*op. cit.*, p. 334).

Hyla quinquevittata Cope. "The largest specimen contained in its stomach over a dozen termites and one ant (*Tetramorium guineense* Fabr.)" (*op. cit.*, p. 341).

It is evident that many more observations are needed before we can fully realize the part amphibians play as predaceous enemies of ants.

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[1] Drake, C. J., 1914, 'The food of *Rana pipiens* Schreber.' The Ohio Naturalist, XIV, pp. 257–269.

[2] Needham, J. C., 1905, 'The summer food of the bullfrog (*Rana catesbiana* Shaw) at Saranac Inn.' New York State Mus., Bull. 86, pp. 9–15.

[3] 1918, 'The amphibians collected by the American Museum Expedition to Nicaragua in 1916,' Bull. American Mus. Nat. Hist., XXXVIII, pp. 311–347, Pls. XIV–XIX.

Enough is known, however, to make it certain that these animals are of prime importance in this respect.

While studying the amphibians of the Lang and Chapin collection, Mr. G. K. Noble, Assistant Curator of Herpetology at the American Museum, dissected the stomachs of a large number of specimens and has turned their contents over to me for identification. The results of these examinations will be published in detail in Mr. Noble's report. From the point of view of the myrmecologist they were of great interest, yielding a large number of remarkable forms; eighty different species, subspecies, and varieties were obtained in this way and, of these, forty were not otherwise represented in the collection upon which Prof. Wheeler's report is based; seventeen of these forms were new to science. Many of the ants found in the stomachs of amphibians are in an excellent state of preservation; others are considerably improved by a thorough cleansing with caustic potash. Future collectors in tropical countries are urged never to neglect this novel manner of increasing their material.

In the table below, I have condensed the results of the examination of 308 stomachs of the eleven species of Congo frogs and toads which apparently show a decided preference for ants; for five of these species ants constitute about 50 per cent or more of the total stomach contents. In addition, several species of Congo frogs had eaten isolated specimens of ants, which may, in some cases, have been swallowed accidentally together with mud, dead leaves, or vegetable matter, an abundance of

Stomach Contents of Congo Amphibians

	Number of Stomachs with Recognizable Food	Total Number of Insects Eaten	Number of Ants	Per Cent of Ants
Bufo polycercus Werner	53	759	406	66.66
" *tuberosus* Günther	5	160	38	23.73
" *funereus* Bocage	55	1292	705	54.56
" *regularis* Reuss	31	963	484	50.25
" *superciliaris* Boulenger	50	746	182	24.39
Rana occipitalis Günther	25	55	14	25.45
" *ornatissima* Bocage	14	30	6	20.
" *albolabris* Hallowell	19	42	25	59.28
" *mascareniensis* Duméril and Bibron	24	40	11	27.50
Hemisus marmoratum (Peters)	22	1006	96	9.54
Phrynobatrachus natalensis (A. Smith)	10	47	20	42.55

which is often found in the stomach. For other species, however, the number of stomachs examined was too small to furnish reliable data; when more completely investigated, some of these may prove to be true ant-feeders.

A number of amphibians collected by the American Museum Congo Expedition and the forms of ants which could be identified by Prof. Wheeler among their stomach contents are listed below. Such records give an insight into the great variety of ants eaten by some of these animals and also, to a certain extent, into the preferences shown by individual species. I must, however, point out that much of the ant débris found in the stomachs was too poorly preserved to permit correct identification, at least with our present knowledge of African myrmecology. These lists could, therefore, be considerably lengthened. Nevertheless, in the case of the toads a sufficient number of specimens have been examined to show that ants are a very important article in their diet; a total of 1815 ants was found in 194 stomachs of the five species of Congo toads; these ants belong to 72 forms, six (or 8 per cent) of which are Dorylinæ, thirty (or 42 per cent) Ponerinæ and Cerapachyinæ, sixteen (or 22 per cent) Myrmicinæ, and nineteen (or 27 per cent) Formicinæ. Terrestrial ants seem to be taken almost exclusively and this fact undoubtedly accounts for the high proportion of the Ponerinæ represented.

Xenopus mülleri (Peters)

A common frog of the Sudanese and East African savannahs. Of ten stomachs examined, only one contained a single ant:

Polyrhachis aĕrope Wheeler.

Xenopus tropicalis (Gray)

A frog confined to the Rain Forest. Of eleven stomachs examined, two together contained five ants:

Camponotus pompeius subsp. *marius* Emery.

Bufo regularis Reuss

This widely distributed African toad occurs in the forest and in the savannah as well. Of thirty-eight stomachs examined, thirty-one showed recognizable food and nineteen of these contained ants:

Dorylus nigricans subsp. *burmeisteri* (Shuckard).
" " subsp. *sjæstedti* Emery.
Platythyrea gracillima Wheeler.
Megaponera fœtens (Fabricius).
Bothroponera soror (Emery).

Anochetus bequaerti Forel.
Pheidole kohli Mayr, var.
" *megacephala* subsp. *melancholica* (Santschi).
Myrmicaria eumenoides subsp. *opaciventris* (Emery).
" " " " var. *crucheti* (Santschi).
Crematogaster excisa (Mayr).
Monomorium bicolor Emery.
" *afrum* var. *fultor* Forel.
Tetramorium guineense subsp. *medje* Wheeler.
Plagiolepis tenella Santschi.
Camponotus maculatus (Fabricius).
" " subsp. *congolensis* Emery.
" " subsp. *solon* Forel.
" " subsp. *brutus* (Forel).
" *acvapimensis* Mayr.
" *rufoglaucus* subsp. *cinctellus* var. *rufigenis* Forel.
" *chapini* Wheeler.
" *polyrhachioides* Emery.
Polyrhachis militaris (Fabricius).

Bufo funereus Bocage

This toad is commonly found in the Rain Forest and the outlying forest galleries. Of sixty-three stomachs examined, fifty-five contained recognizable food and forty-three of these ants:

Dorylus emeryi subsp. *opacus* Forel.
" *kohli* Wasmann.
" *nigricans* subsp. *arcens* (Westwood).
" *wilverthi* Emery.
Cerapachys cribrinodis Emery.
Paltothyreus tarsatus (Fabricius).
Megaponera fœtens (Fabricius).
Bothroponera talpa Ern. André.
" *pachyderma* (Emery).
" *soror* (Emery).
Phrynoponera gabonensis (Ern. André).
" " var. *esta* Wheeler.
" " var. *fecunda* Wheeler.
" " var. *striatidens* (Santschi).
Euponera ingesta Wheeler.
" *sennaarensis* (Mayr).
Plectroctena cristata Emery.
Psalidomyrmex procerus Emery.
Leptogenys stuhlmanni subsp. *camerunensis* var. *opalescens* Wheeler.
Anochetus estus Wheeler.
" *opaciventris* Wheeler.
Odontomachus assiniensis Emery.
" " var. *furvior* Wheeler.
" *hæmatoda* (Linnæus).

Pheidole batrachorum Wheeler.
Myrmicaria eumenoides subsp. *opaciventris* (Emery).
" " " var. *crucheti* (Santschi).
Meranoplus nanus subsp. *soriculus* Wheeler.
Triglyphothrix gabonensis Ern. André.
" *mucidus* Forel.
Cataulacus guineensis F. Smith.
Engramma wolfi Forel.
Plagiolepis tenella Santschi.
Pseudolasius weissi var. *sordidus* Santschi.
Camponotus maculatus subsp. *solon* Forel.
" " subsp. *brutus* (Forel).
" *acvapimensis* Mayr.
" *pompeius* subsp. *marius* Emery.
" *wellmani* var. *rufipartis* Forel.
" *rufoglaucus* subsp. *cinctellus* var. *rufigenis* Forel.
" *viridus* subsp. *cato* (Forel).
Polyrhachis militaris (Fabricius).
" *concava* Ern. André.

Bufo tuberosus Günther

A forest toad, much less common than the other species. Only five stomachs could be examined and each contained a number of worker ants:

Paltothyreus tarsatus (Fabricius).
Bothroponera soror (Emery).
" *pachyderma* (Emery).
Phrynoponera gabonensis var. *esta* Wheeler.
" " var. *fecunda* Wheeler.
" " var. *striatidens* (Santschi).
Euponera subiridescens Wheeler.
Odontomachus assiniensis Emery.
Triglyphothrix gabonensis Ern. André
Cataulacus guineensis F. Smith.
Polyrhachis viscosa F. Smith (?).

Bufo polycercus Werner

One of the three common forest toads of the Congo. Of the fifty-four stomachs dissected, fifty-three contained recognizable remains and thirty-one of these ants:

Dorylus wilverthi Emery.
Paltothyreus tarsatus (Fabricius).
Megaponera fœtens (Fabricius).
Bothroponera pachyderma (Emery).
" " var. *funerea* Wheeler.
" *talpa* Ern. André.
" *soror* (Emery).

Phrynoponera gabonensis (Ern. André).
" " var. *esta* Wheeler.
" " var. *fecunda* Wheeler.
" " var. *umbrosa* Wheeler.
" " var. *striatidens* (Santschi).
Euponera ingesta Wheeler.
" *subiridescens* Wheeler.
Plectroctena cristata Emery.
" *minor* Emery.
Psalidomyrmex procerus Emery.
" *reichenspergeri* Santschi.
Leptogenys stuhlmanni subsp. *camerunensis* var. *opalescens* Wheeler.
" *ergatogyna* Wheeler.
Anochetus opaciventris Wheeler.
Odontomachus assiniensis Emery.
" " var. *furvior* Wheeler.
Pheidole batrachorum Wheeler.
" *megacephala* (Fabricius).
Crematogaster concava Emery.
Triglyphothrix gabonensis Ern. André.
Cataulacus guineensis F. Smith.
Engramma wolfi Forel.
Plagiolepis tenella Santschi.
Pseudolasius weissi var. *sordidus* Santschi.
" *bufonum* Wheeler.
Camponotus maculatus subsp. *solon* Forel.
" " subsp. *brutus* (Forel).
" *pompeius* subsp. *marius* Emery.
" *vividus* subsp. *cato* (Forel).
Polyrhachis militaris subsp. *cupreopubescens* var. *nkomoënsis* Forel.
" *nigrita* Mayr.

Bufo superciliaris Boulenger

A common toad of the Rain Forest in Cameroon, Gaboon and the Congo. Of fifty-six specimens examined in this respect, fifty showed recognizable remains of food in the stomach and thirty-five of these contained ants:

Dorylus nigricans subsp. *sjœstedti* Emery.
Paltothyreus tarsatus (Fabricius).
Megaponera fœtens (Fabricius).
Bothroponera talpa Ern. André.
" *pachyderma* (Emery).
" *soror* (Emery).
Phrynoponera gabonensis var. *esta* Wheeler.
" " var. *fecunda* Wheeler.
" *bequaerti* Wheeler.
Euponera subiridescens Wheeler.

Plectroctena cristata Emery.
Psalidomyrmex procerus Emery.
“ *obesus* Wheeler.
Odontomachus assiniensis Emery.
“ “ var. *furvior* Wheeler.
Myrmicaria eumenoides subsp. *opaciventris* Emery.
Tetramorium guineense (Fabricius).
Engramma wolfi Forel.
Pseudolasius bufonum Wheeler.
Camponotus pompeius subsp. *marius* Emery.
“ *wellmani* var. *rufipartis* Forel.

Phrynobatrachus perpalmatus Boulenger

A water frog of the forest region. Only eight of the stomachs examined contained recognizable remains of food and ants were found in one of these:

Polyrhachis alluaudi var. *anteplana* Forel.

Parts of many more ants were seen in the stomachs of the related savannah species *Phrynobatrachus natalensis* (A. Smith), but too poorly preserved for correct identification.

Arthroleptis variabilis Matschie

This is one of the typical frogs of the Cameroon, Gaboon and Congo Rain Forest. Seventeen of the stomachs examined contained recognizable food and two of these included ants:

Pheidole batrachorum Wheeler.
Aëromyrma sp.

Rana occipitalis Günther

A large-sized frog, common in the vicinity of streams, ponds, and swamps throughout the forest and savannah, from Senegambia to Angola, Uganda and East Africa. All of the twenty-five stomachs examined, contained recognizable food and ants were present in ten cases:

Dorylus nigricans subsp. *sjœstedti* Emery.
Paltothyreus tarsatus (Fabricius).
Megaponera fœtens (Fabricius).
Bothroponera soror (Emery).
Odontomachus hæmatoda (Linnæus).
Myrmicaria eumenoides subsp. *opaciventris* (Emery).
Camponotus maculatus subsp. *congolensis* Emery.
“ *acvapimensis* Mayr.
“ *cæsar* Forel.
“ *wellmani* var. *rufipartis* Forel.
“ *chapini* Wheeler.

Rana albolabris Hallowell

A characteristic frog of the Rain Forest, extending a little beyond the limits of the forest in swamps and along forest galleries. The stomachs of twenty-three individuals were dissected and nineteen of these showed recognizable remains of food; ants were present in three cases only:

Bothroponera pachyderma (Emery).
Odontomachus assiniensis var. *aterrimus* Wheeler.
Camponotus maculatus subsp. *solon* Forel.

Rana mascareniensis Duméril and Bibron

Perhaps the most common frog throughout the larger part of the African continent. Of the thirty-nine stomachs examined, twenty-four contained recognizable remains, and a small number of ants, all of the winged phases, were found in five of them:

Pheidole megacephala (Fabricius).
Camponotus viridus subsp. *cato* (Forel).

Rana ornatissima Bocage

This frog is much rarer than the three preceding species; it is known from the savannahs south of the Rain Forest, from Angola to Southern Rhodesia and also from the northeastern Uele, where Lang and Chapin collected a number of specimens at Garamba. Of these, fifteen were examined for their food contents and fourteen contained recognizable remains; a few ants were found in a single stomach:

Pheidole kohli Mayr, var.
" *megacephala* subsp. *melancholica* (Santschi).
" *speculifera* Emery.

In addition, twenty stomachs of two other common Congo frogs (*Rana oxyrhynchus* A. Smith and *R. christyi* Boulenger) were dissected, but only a single winged ant was found. The pronounced aquatic habits of all species of *Rana*, which keep them in or near the water, evidently prevent them from feeding to any large extent on ants, except on individuals that accidentally drop into the water, as for instance, during their nuptial flights.

Kassina senegalensis (Duméril and Bibron)

A small frog occurring throughout the savannah country of Africa, with rather terrestrial habits and also said occasionally to ascend trees. A few ants were found in two of the nineteen stomachs dissected. The occurrence in one stomach of a number of workers of the hypogæic ant *Dorylus kohli* is interesting in connection with the burrowing habits of this frog.

Dorylus kohli Wasmann.
Pheidole megacephala subsp. *melancholica* (Santschi).

Hemisus marmoratum (Peters)

This little burrowing frog, of pronounced terrestrial habits, is found in the savannah country of a large part of Africa, north, south, and east of the Rain Forest. It lives mostly underground, and, according to Mr. Lang's observations, comes out of its burrows only after heavy rains. It is the most typical "ant-eater" of all Congo amphibians; twenty-two stomachs examined contained no other food than termites and worker ants, though termites were by far more abundant. True ants were found in four stomachs only:

Dorylus kohli Wasmann.
" *conradti* Emery.
Tetramorium pusillum var. *hemisi* Wheeler.

REPTILES

Lizards often chew or lacerate their food to such an extent that the examination of their stomach contents gives but very general indications with regard to their diet. There can hardly be any doubt, however, that Formicidæ are part of the bill of fare of many of these reptiles. In Miss A. H. Pritchett's careful experiments,[1] ants, *Pogonomyrmex barbatus* subspecies *molefaciens* (Buckley) and *Pachycondyla harpax* (Fabricius), were eaten readily by *Sceloporus spinosus floridanus* (Baird), a common lizard of Texas. Another species, *Gerrhonotus infernalis* Baird, refused to eat *Camponotus maculatus* subspecies *sansabeanus* (Buckley) and *C. fumidus* variety *festinatus* (Buckley), but the author suggests that these ants were possibly too small to be noticed, as insects below a certain size are apparently not perceived by the large species of lizards. Concerning *Phrynosoma cornutum* (Harlan), Miss Pritchett writes: "The 'horned toads' were kept in cages with other lizards and also separately and were never seen to eat anything but ants. They are especially fond of the large agricultural ant, *Pogonomyrmex barbatus* Smith variety *molefaciens* Buckley" (p. 284).

In his paper on 'The horned lizards of California and Nevada of the genera *Phrynosoma* and *Anota*,' H. C. Bryant[2] says that ants, flies, and other insects constitute the principal diet of these genera and remarks: "Why the animal is never bothered by being stung internally by the ants it eats, seems hard to explain. Certainly the lining of the mouth and stomach must be particularly adapted to withstand the poisonous sting of insects, for when stung externally, the lizard shows no little discomfiture" (p. 17). Unlike most other reptiles, the horned toad catches the insects on the end of its viscid tongue and swallows them alive, its feeding habits being indeed very similar to those of true toads. C. L. Camp[1] has published more detailed observations on the food of many California lizards. He found remains of ants in the stomach contents of the following species: *Uma notata* Baird, *Callisaurus ventralis ventralis* (Hallowell), *Uta stansburiana elegans* (Yarrow), *Sceloporus magister* Hallowell, *Phrynosoma platyrhinos* Girard, and *Cnemidophorus tigris tigris* Baird and Girard. In the case of one of the horned toads (*Phrynosoma*) examined, the contents of the stomach were: "fifteen parasitic nematodes, six Coleoptera, one orthopter, 145 red-headed ants, all apparently of the same species and swallowed whole, and one pebble" (p. 528). These ants belonged in all probability to one of the seed-storing species of *Pogonomyrmex*, for Mitchell and Pierce[2] also note that in Texas remains of *P. barbatus* (F. Smith) subspecies *molefaciens* (Buckley) were found several times in the excrement of the horned toad, *Phrynosoma cornutum* (Harlan), and "one colony was absolutely exterminated before the enemy left it."

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[1] 1903, Biol. Bull., V, pp. 271-287.
[2] 1911, Univ. of California Publ. Zool., IX, No. 1, pp. 1-84, Pls. I-IX.

The Australian horned dragon or moloch (*Moloch horridus*) is said by Saville Kent to feed exclusively on ants of the minutest size.

> The small black evil-odored species [of ant], common in both South and Western Australia, was always a prime favorite with the specimens kept by the author, and wherever these ants abounded, in conjunction with a sufficiently warm temperature, no difficulty was experienced in maintaining these lizards in perfect health. . . . They would soon settle down to feeding in a row, and the number of ants an individual lizard would assimilate was something astonishing. On several occasions experimental reckoning elicited the fact that no less than from one thousand to fifteen hundred ants were taken in successive order at a single meal, each ant being separately picked up by a flashlike protrusion of the slender adhesive tongue.[3]

On examination of the stomachs of the lizards and chameleons collected by the American Museum Congo Expedition, Mr. K. P. Schmidt[4] found remains of ants, usually in a condition preventing any further identification, in the following species: *Lygodactylus picturatus gutturalis* (Bocage), *Agama colonorum* Daudin, *Bedriagaia tropidopholis* Boulenger, *Algiroides africanus* Boulenger, *Holaspis guentheri* Gray, *Ger-*

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[1] 1916, 'Notes on the local distribution and habits of the amphibians and reptiles of Southeastern California in the vicinity of the Turtle Mountains,' Univ. of California Publ. Zool., XII, No. 17, pp. 503-544, Pls. XIX-XXII. Through the courtesy of Mr. Camp I have been able to examine the stomach contents of a number of reptiles collected by him near the Turtle Mountains, Riverside Co., California. In the case of *Uma notata* the stomachs were almost entirely filled with heads and parts of the body of *Pogonomyrmex*, while in those of *Phrynosoma platyrhinos* there were heads of ants and also pieces of beetles.

[2] 1912, Proc. Ent. Soc. Washington, XIV, p. 72.

[3] Saville Kent, W., 1897, 'The naturalist in Australia,' (London), pp. 85-86.

[4] 1919, 'Contributions to the herpetology of the Belgian Congo based on the collection of the American Museum Congo Expedition, 1909-1915. Part I. Turtles, Crocodiles, Lizards, and Chameleons,' Bull. American Mus. Nat. Hist., XXXIX, pp. 385-624.

rhosaurus flavigularis nigrolineatus (Hallowell), *Mabuya polytropis* Boulenger, *Chamæleon gracilis* (Hallowell), and *C. ituriensis* K. Schmidt.

The African skinks of the genus *Mabuya* feed on a great variety of insects, but certain of the forest species often follow the columns of the driver ants (Dorylinæ). Sjöstedt has observed this in Cameroon with *Mabuya raddoni* (Gray). He says:

> This lizard is one of the most diligent persecutors of driver ants, and wherever one of their columns was seen on the move in or at the margin of the forest, especially after the ants had scattered in search of food, one could be sure to find one or more of these graceful animals preparing for an excellent catch. It was a delight to observe how adroitly the agile lizards would plunge into the crawling swarm, fill their mouth with ants and then retire to a place of safety to devour their booty. Busily engaged in their hunt, they would fearlessly run about the motionless observer and not even hesitate to climb his legs, always twinkling their lively little eyes, on the lookout for possible danger.[1]

BIRDS

Comparatively few birds of temperate regions have acquired a fondness for ants; for instance, of fifty species in Tyrol whose stomach contents were examined by Dalla Torre,[2] only the following five contained remains of ants to any extent: *Cypselus melba* (Linnæus), *Anthus arboreus* Bechstein, *Tetrao medius* Meyer, *Colymbus cristatus* Linnæus, and *Picus viridis* Linnæus. In the case of the green woodpecker, the stomach was crammed full of *Formica rufa* and *Lasius niger*. Newstead[3] found that the European song-thrush, *Turdus musicus* Linnæus, and the blackbird, *Merula merula* (Linnæus), occasionally eat worker ants. Many insectivorous and omnivorous birds undoubtedly have similar habits.[4]

A great fund of accurate information concerning the food of Hungarian birds is contained in a series of articles by E. Csiki.[5] The identification of the insects found in each bird stomach examined is given and also the number of specimens of each species. I have been able to consult only the first eight papers of the series (1904–1912), in which fifty-six species of birds are studied in this respect. All of them, however, are insectivorous or at least carnivorous, with the exception of the common gray partridge, *Perdix perdix* (Linnæus), which is chiefly a grain-feeder. Of the fifty-six birds, forty-nine showed ants in their stomach contents, but in the majority of cases these insects were present in isolated specimens only. The following eight birds, alone, evidently exhibited a true myrmecophagous propensity:

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[1] 1897, Bihang Svenska Vet. Ak. Handl., XXIII, pt. 4, No. 2, pp. 14–15.

[2] Dalla Torre, K. W. v., 1889. 'Untersuchungen über den Mageninhalt verschiedener Vögel,' Biol. Centralbl., VIII, pp. 473–480.

[3] Newstead, R., 1901, 'The food of some birds inhabiting an orchard,' Gardeners' Chronicle, (3) XXX, pp. 197 and 217–218.

[4] H. C. McCook (1890, 'American spiders and their spinningwork,' II, pp. 361–363) gives some additional evidence of birds feeding on ants. See also Cockerell, T. D. A., 1890, 'What are the uses of bright colors in Hymenoptera?' Ent. News, I, pp. 65–68.

[5] Csiki, E. 'Positive Daten über die Nahrung unserer Vögel,' Aquila, Budapest, 1904, XI, pp. 270–317; 1905, XII, pp. 312–330; 1906, XIII, pp. 148–161; 1907, XIV, pp. 188–202; 1908, XV, pp. 183–206; 1909, XVI, pp. 139–144; 1910, XVII, pp. 205–218; 1913, XX, pp. 375–396; 1914, XXI, pp. 210–229. 'Die Insektennahrung des Rebhuhns (*Perdix perdix* L.),' ibid., 1912, XIX, pp. 202–209.

Dryobates major (Linnæus). The greater spotted woodpecker is a typical ant-feeder; of twenty-three stomachs examined, fifteen contained ants, often in large numbers, belonging to the following six species: *Lasius flavus*, *L. niger*, *L. fuliginosus*, *Camponotus ligniperdus*, *Formica rufa*, and *Dolichoderus 4-punctatus*.

Dryobates medius (Linnæus). The middle spotted woodpecker feeds also largely on ants; of nine stomachs, six contained such insects, also often in abundance. The following species were recognized: *Lasius fuliginosus*, *L. alienus*, *Formica rufibarbis*, *F. rufa*, and *Myrmica lævinodis*.

Dryobates minor (Linnæus). Ants are also readily eaten by the lesser spotted woodpecker; five of the eight stomachs examined contained specimens, often in great numbers, of the following species: *Lasius alienus*, *L. fuliginosus*, *Camponotus sylvaticus*, and *Dolichoderus 4-punctatus*.

Picus viridis Linnæus. The main food of the green woodpecker consists of ants, which were present in all of the twenty stomachs analyzed, often the only contents and in considerable quantities (as many as 500 or 600 specimens in a single stomach). Ten species of ants were recognized: *Lasius alienus*, *L. flavus*, *L. fuliginosus*, *L. niger*, *Formica pratensis*, *F. rufa*, *F. rufibarbis*, *Camponotus vagus*, *Myrmica lævinodis*, and *Aphænogaster structor*.

Picus canus Gmelin. Only ants were found in the stomachs of the three specimens of the gray-headed green woodpecker examined; they belonged to five species: *Lasius alienus*, *L. flavus*, *Formica rufa*, *F. rufibarbis*, and *Camponotus vagus*.

Dryocopus martius (Linnæus). There were ants in five of the six stomachs examined of the great black woodpecker; often in abundance and of three species: *Lasius alienus*, *Camponotus ligniperdus*, and *C. vagus*.

Jynx torquilla (Linnæus). The wryneck subsists chiefly on ants; all the eighteen stomachs examined contained these insects, often in large numbers, six species being represented: *Lasius niger*, *L. alienus*, *Formica rufa*, *Camponotus sylvaticus*, *Myrmica lævinodis*, and *Tetramorium cæspitum*.

Perdix perdix (Linnæus). The common gray partridge feeds mainly on seeds and other vegetable substances, but it frequently picks up animals of various kinds. Of the 285 stomachs examined by Csiki, 177 (or 61.1%) also contained insects. The bulk of this insect food seems to have consisted of ants, which were found in 134 stomachs (or 47%), often in great quantities. *Lasius alienus* was present in 72 cases; *L. niger* in 57 cases; *Formica rufa* in 11 cases; *F. pratensis* in 2 cases.

All European observers agree that the green woodpecker, *Picus viridis* Linnæus, is one of the foremost ant-feeders. According to Wasmann's[1] observations in the Netherlands, this bird does not merely limit its myrmecophagous appetite to wood-boring ants (*Camponotus*), but frequently burrows into the nests of certain terrestrial species. In the spring and fall the excrement contains remains of many kinds, such as *Myrmica rubra*, *M. scabrinodis*, *Lasius niger*, *L. flavus*, *L. fuliginosus*, *Formica pratensis*, *F. rufa*, *F. rufibarbis*, and *F. sanguinea*, while in severe winters this woodpecker seems to feed almost exclusively on *Formica rufa* and *F. pratensis*, inserting its bill into their mound-shaped nests. W. C. Angus[2] also found that the stomach of one of these woodpeckers, shot in January in North Wales, contained *Myrmica scabrinodis*, "a common ant which nests on ground-hillocks, but never in trees."[3]

The very complete inventory of the food of the woodpeckers and their allies (Picidæ) in the United States published by Beal has led to the interesting results contained in the table below, in which the species are arranged in the order of their importance as ant-eaters. It may be seen that, for these birds, "ants constitute the largest item of animal food—28.41 per cent, considering the whole 16 species collectively—and are actually the largest item in the stomachs of 8 species. The Williamson sapsucker, the red-cockaded woodpecker, and the two flickers take the highest rank in this respect. Beetles stand next in importance, and amount to 20.42 per cent. These two items together form nearly half the food. The remainder of the animal food is composed of insects, with a few spiders, millepeds, and sowbugs, and occasionally a salamander, tree frog, lizard, or snail."[4]

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[1] Wasmann, E., 1905, 'Zur Myrmecophagie des Gruenspechts,' Tijdschr. v. Ent., XLVIII, pp. 214–220. Wasmann likewise observed the chaffinch, *Fringilla cœlebs* Linnæus, boring into a small nest of *Lasius niger* of which it picked up cocoons and workers as well.

[2] 1885, Proc. Nat. Hist. Soc. Glasgow, N. S., I, p. xviii.

[3] See also Leisewitz, W., 1905, 'Ueber die wirtschaftliche Bedeutung unserer Spechte,' Verh. Ornithol. Ges. Bayern, V, (1904), pp. 64–76.

[4] Beal, F. E. L., 1911, 'Food of the woodpeckers of the United States,' U. S. Dept. of Agric. Biol. Surv., Bull. 37, p. 10. See also C. V. Riley's account of 'Insects that woodpeckers eat' in Warren, B. H., 1890, 'Report on the birds of Pennsylvania,' 2d Ed., (Harrisburg), pp. 176–178.

Food of North American Picidæ

Name of Species	Number of Stomachs Examined	Per cent of Animal Food	Per cent of Ants
Williamson sapsucker, *Sphyrapicus thyroideus* (Cassin)	17	86.67	85.94
Red-cockaded woodpecker, *Dryobates borealis* (Vieillot)	76	81.06	56.75
Red-shafted flicker, *Colaptes cafer* (Gmelin)	183	67.74	53.82
Flicker, *Colaptes auratus* (Linnæus)	684	60.92	49.75
Red-breasted sapsucker, *Sphyrapicus ruber* (Gmelin)	34	68.92	42.49
Pileated woodpecker, *Phlæotomus pileatus* (Linnæus)	80	72.88	39.91
Yellow-bellied sapsucker, *Sphyrapicus varius* (Linnæus)	313	49.31	34.31
Downy woodpecker, *Dryobates pubescens* (Linnæus)	723	76.05	21.36
Hairy woodpecker, *Dryobates villosus* (Linnæus)	382	77.67	17.10
Lewis woodpecker, *Asyndesmus lewisi* Riley	59	37.48	11.87
Three-toed woodpecker, *Picoides americanus* Brehm	23	94.06	8.29
Nuttall woodpecker, *Dryobates nuttallii* (Gambel)	53	79.41	8.19
California woodpecker, *Melanerpes formicivorus bairdi* Ridgway	84	22.59	8.09
Red-bellied woodpecker, *Centurus carolinus* (Linnæus)	271	30.94	6.45
Arctic three-toed woodpecker, *Picoides arcticus* (Swainson)	28	88.69	6.35
Red-headed woodpecker, *Melanerpes erythrocephalus* (Linnæus)	443	33.83	5.17
Total	3453		
Average		64.26	28.49

It would be worth while to consider in more detail the choice of food made by these ant-eating woodpeckers. Unfortunately, I have not found the needed information for some of the species included in the above list, such as, for example, the Williamson sapsucker; many of the other woodpeckers, especially those of the genera *Dryobates*, *Phlæotomus*, and *Melanerpes*, merely eat ants which they find in wood or underneath bark (*Camponotus* and *Crematogaster*). The flickers (*Colaptes*), however, are the ant-eaters *par excellence* among North American birds, for they have made ants their favorite food; they are also more terrestrial in habits than the other woodpeckers and this explains how their ant diet includes not only wood- and bark-boring species, but also many others that nest in the ground (*Formica*, *Lasius*, *Myrmica*, *Aphænogaster*, *Solenopsis*, *Prenolepis*, etc.).

> In one case a stomach and crop [of *Colaptes auratus*] were both filled with very small ants (*Crematogaster* species). The whole mass was divided with care into 16 parts as nearly equal as possible, and in one part 315 ants were counted, giving 5,040 in one meal of one flicker. In addition there were at least 100 pupæ. Two other stomachs and crops examined in the same way each gave a little over 3,000 ants. Probably each of the 100 stomachs in the collection contained nearly as much ant food as these, but the number of ants was less because they were of larger species. A large proportion of the ants eaten are of species that live in the earth, and these appear to be the principal food the flicker obtains on the ground. In every case where the stomach held a quantity of these small ants, a lot of fine sand revealed their source.[1]

In his study on 'The tongues of woodpeckers,' F. A. Lucas has the following interesting remarks which may be quoted in connection with our subject.

> Considering the tongues in relation to food, we find that those of the various species of flickers (*Colaptes*) have the fewest terminal barbs and the longest dorsal tract of fine points; they are also among the longest. The members of the genus are particularly fond of ants, and the tongue seems especially adapted for probing ant hills. The function of the fine points on the upper part of the tongue seems to be to form a rough surface to which the sticky saliva will readily adhere and to which in turn the ants will be stuck. In this genus the submaxillary salivary glands reach the maximum size in the group.[2]

In North America the western meadowlark, *Sturnella magna neglecta* (Audubon), and the roadrunner, *Geococcyx californianus* (Lesson), may be taken as typical illustrations of occasional ant-feeders. The food of these birds has been investigated in California by H. C. Bryant.[3] About 2000 stomachs of the western meadowlark were examined, and 16.7 per cent of these contained remains of ants, which amounted to 3 per cent (volume) of the total food of all the specimens studied. Ants appear to be taken by this bird irrespective of size or kind. Of species identified, I may mention *Tapinoma sessile*, *Messor andrei*, *Pogonomyrmex californicus*, and species of *Camponotus* and *Formica*. In the case of the roadrunner, of which 84 stomachs were examined, a little over 4 per cent of the total food was made up of ants, bees, and wasps; one of these stomachs contained over 250 red ants (*Pogonomyrmex californicus*), along with a quantity of caterpillars, crickets, beetles, and grasshoppers;

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[1] Beal, F. E., *op. cit.*, p. 54.

[2] 1895, U. S. Dept. of Agric. Biol. Surv., Bull. 7, p. 38.

[3] 1914, 'A determination of the economic status of the western meadowlark (*Sturnella neglecta*) in California,' Univ. of California Publ. Zool., XI, No. 14, pp. 21–24. 1916, 'Habits and food of the roadrunner in California,' *op. cit.*, XVII, No. 5, pp. 21–58, Pls. 1–iv.

another bird had eaten ten carpenter ants (*Camponotus* species). According to records in the United States Biological Survey, published by W. D. Hunter,[1] the following Texas birds are known to prey upon the agricultural ant, *Pogonomyrmex barbatus* subspecies *molefaciens* (Buckley): great-tailed grackle, *Megaquiscalus major macrourus* (Swainson); upland plover, *Bartramia longicauda* (Bechstein); burrowing owl, *Speotyto cunicularia hypogæa* (Bonaparte); Texas nighthawk, *Chordeiles acutipennis texensis* Lawrence; scissor-tailed flycatcher, *Muscivora forficata* (Gmelin); kingbird, *Tyrannus tyrannus* (Linnæus); redbird, *Cardinalis cardinalis* (Linnæus); and mockingbird, *Mimus polyglottos* (Linnæus).

Cleland's recent account of the food of Australian birds,[2] makes it clear that the rich ant fauna of that continent is preyed upon by a great many birds of different families. Of a total of 224 species examined with regard to their stomach contents, 73 were found to contain ants, though as a rule these insects were present in small quantities only. The following list contains such species as seem to show a preference for ants.

Black-breasted plover.—*Zonifer tricolor* (Vieillot).
Lesser golden plover.—*Charadrius dominicus* (P. Müller).
Brown flycatcher.—*Micrœca fascinans* (Latham).
Flame-breasted robin.—*Petrœca phœnicea* Gould.
Scrub robin.—*Drymaœdus brunneopygius* Gould.
Coach-whip bird.—*Psophodes crepitans* (Latham).
Blue wren.—*Malurus cyanochlamys* Sharpe.
Grey shrike-thrush.—*Collyriocichla harmonica* (Latham).
Black-backed magpie.—*Gymnorhina tibicen* (Latham).
White-backed magpie.—*Gymnorhina leuconota* Gray.
White-throated thickhead.—*Pachycephala pectoralis* (Gould).
Yellow-breasted shrike-robin.—*Eopsaltria australis* (White).
White-throated tree-creeper.—*Climacteris picumna* (Temminck).
Brown tree-creeper.—*Climacteris scandens* Temminck.
Noisy minah.—*Myzantha garrula* (Latham).
Yellow-throated minah.—*Myzantha flavigula* Gould.

Most of the ants found in these stomachs were not identified. In the case of the *Micrœca* and the species of *Myzantha*, remains of *Camponotus nigriceps* (Smith) and of a *Polyrhachis* were recognized. Two of the stomachs of *Psophodes crepitans* contained a large quantity of the heads and legs of ants, chiefly the "green-head ant" [*Rhytidoponera metallica* (F. Smith)]; some of the *Malurus cyanochlamys*, *Gymnorhina tibicen*, *Eopsaltria australis*, *Climacteris picumna*, and *C. scandens* had also fed on this or allied Ponerinæ. Bulldog ants (*Myrmecia* species) were found in large numbers in the stomachs of *Collyriocichla harmonica*, *Gymnorhina tibicen*, *G. leuconota*, *Pachycephala pectoralis*, *Eopsaltria australis* [in this case the ant being identified as *Myrmecia gulosa* (Fabricius)], and *Myzantha garrula*. I am informed by Prof. Wheeler that the two ponerine genera *Myrmecia* and *Rhytidoponera* contain some of the largest and most conspicuous members of the Australian ant-fauna, and all of them sting or both sting and bite severely.

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[1] 1912, U. S. Dept. Agric. Bur. Ent. Circ. No. 148, p. 6.

[2] Cleland, J. B., 1918, 'The food of Australian birds. An investigation into the character of the stomach and crop contents,' Science Bull. No. 15, Dept. of Agric. New South Wales, 112 pp.

The myrmecophagous habit is perhaps most highly developed among birds of tropical regions, many of which are entirely or almost restricted to this kind of diet. Thus, F. Dahl concludes that, in the Bismarck Archipelago, insectivorous birds are the most dangerous enemies of ants. Of about ninety species of terrestrial birds examined by Dahl in that region, twenty-eight were found to be more or less ant-eating; some fifteen of these had captured the winged sexual phases only, at the time of the nuptial flights; twelve others had also fed on worker ants picked up outside their nests, the list of these including flycatchers (*Pœcilodryas*, *Monarcha*, *Rhipidura*), thickheads (*Pachycephala*), drongos (*Dicrurus*), honeyeaters (*Myzomela*), timeliids (*Ortygocichla*), and warblers (*Cisticola*). The stomach of one of the warblers, *Megalurus macrurus* (Salvadori), was filled with the workers and sexual phases of a species of *Polyrhachis* (near *schenki*),[1] of which it apparently destroys the nests, though it feeds on many other insects too.[2]

In their discussion of the food-habits of Indian birds, Mason and Maxwell-Lefroy[3] summarize the evidence concerning the Formicidæ as follows:

> The ants, like the grasshoppers, are exceedingly abundant insects and form a very large proportion of the insect food of birds in India. They are perhaps the favorite food of the woodpeckers, wrynecks, rollers, and some of the pheasants. Most birds that eat insects of any kind will almost certainly be found to take ants of one species or another. The following species occur in this paper as taken by birds: *Acantholepis frauenfeldi* variety *bipartita*, *Camponotus compressus*, *Cataulacus taprobana*, *Crematogaster subnuda*, *Dorylus* species, *Meranoplus bicolor*, *Myrmecocystus setipes*, *Œcophylla smaragdina*, *Pheidole malinsi*, and *Polyrhachis simplex*.

Of 109 species of birds examined by these authors in the plains of northeastern India, near Pusa, forty-eight showed remains of ants in their stomach. In most cases these insects were present in small numbers only. Certain Indian birds, however, feed entirely on ants and foremost among these are, again, the woodpeckers. Three stomachs of the northern rufous woodpecker, *Micropternus phæoceps* Blyth, contained exclusively ants: 1459 *Crematogaster subnuda* in the first; 2600 of the same ant in the second; 725 of this *Crematogaster*, 304 *Pheidole malinsi*, and 27 pupæ and larvæ of *Œcophylla smaragdina* in the third. Of 3921 insects taken by 16 specimens of another woodpecker, *Brachypternus aurantius* (Linnæus), 1738, or 44 per cent, were ants (*Camponotus compressus*, *Œcophylla smaragdina*, *Meranoplus bicolor*, *Myrmecocystus setipes*, and *Crematogaster subnuda*), and in several instances the bird's stomach contained nothing else. An interesting result was obtained with the wryneck, *Jynx torquilla* (Linnæus): seven stomachs contained 1540 insects, all but eight of which were ants, mostly of the species *Pheidole malinsi*. Another prominent ant-feeder in India is the brown shrike, *Lanius cristatus* Linnæus; of 111 insects taken by seven birds, 41, or 36 per cent, were ants (*Œcophylla smaragdina* and *Crematogaster subnuda*).

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[1] Forel remarks in this connection: "I have long suspected that the spines of the species of *Polyrhachis* may have the purpose of disgusting birds and other predaceous animals from using them as food. But this is a mere supposition. At any rate the findings of Prof. Dahl show that they are eaten by birds, which seems natural considering that they so frequently nest among leaves."

[2] Dahl, F. 1901. "Das Leben der Ameisen im Bismarck-Archipel," Mitt. Zool. Mus. Berlin, II, 1, pp. 43–44. It must be noted that the stomach of only one *Megalurus macrurus* was examined.

[3] Mason, C. W. and Maxwell-Lefroy, H., 1912. "The food of birds in India." Mem. Dept. Agric. India, Ent. Ser., III, pp. 1–371.

Similar observations on South and Central American birds would be extremely valuable, for it is surprising how few accurate data have been published, as yet, with regard to the food habits of most tropical birds. For this reason, I include a list of the Nicaraguan birds in the stomach of which Mr. W. De Witt Miller has found remains of ants.[1]

Geococcyx velox (A. Wagner). One stomach contained a mass of insects, including three fairly large ants; several other birds of this species showed no ants.

Chloronerpes rubiginosus yucatanensis (Cabot). Fragmentary remains of many ants were found in one stomach. The proventriculus and stomach of another individual were filled with ants, some of these being mostly yellowish and 10 mm. long; there was also one beetle. In a third case the stomach contained a large number of ants of at least two kinds, by far the majority belonging to a small yellowish species; also at least one small beetle. Many ants were present in the stomach of a fourth bird.

Ceophlœus lineatus similis (Lesson). Two stomachs examined contained numerous ants and bits of other insects.

Centurus hoffmanni Cabanis. In one case the stomach showed no other food than many ants of various kinds, while that of another bird was filled with fruit of a *Cecropia*.

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[1] I am greatly indebted to Mr. W. DeWitt Miller, Associate Curator of Ornithology in The American Museum of Natural History, for permission to use this information, and also for many valuable suggestions and criticisms on my account of birds as predaceous enemies of ants.

Xiphocolaptes emigrans emigrans Sclater. Insects, including many ants, in one stomach; three other stomachs contained no ants.

Saltator magnoides medianus Ridgway. One stomach contained, among other things, a number of myrmecine ants.

Amblycercus holosericeus (Lichtenstein). One stomach was filled with insects, including at least one small black ant.

Thamnophilus doliatus (Linnæus). One stomach contained two small black ants among other insects; that of another individual was filled with fair-sized ants of at least two kinds, some black, some yellow; no ants were found in three other stomachs of this species.

Pachysylvia decurtata (Bonaparte). Two stomachs contained in one case one, and in the other four ants, among other insects.

Pachyrhamphus cinnamomeus Lawrence. One stomach was completely filled with insects, including two ants.

Synallaxis pudica nigrifumosa (Lawrence). One ant among many other insects, in one stomach.

Hylocichla ustulata swainsoni (Cabanis). Insects, including one ant head, were found in one stomach.

Euthlypis lachrymosa (Cabanis). The contents of one stomach consisted of insects, including ants.

Cyclarhis flaviventris Lafresnaye. Insects, including a few ants, were found in one stomach. Another bird contained no ants.

Myiopagis placens accola Bangs. One stomach showed a few insects, including one ant head.

Salpinctes fasciatus Salvin and Godman. In two stomachs examined a number of ants were found, together with other insects.

As Mr. Miller points out, it would seem that, except in the case of certain woodpeckers (*Chloronerpes*, *Ceophlœus*, and *Centurus*), ants are an exception in the food of the insectivorous birds of Central America. Perhaps the most pronounced ant-feeders of all Neotropical birds are the curious woodpeckers of the genus *Celeus*. G. F. Gaumer describes the habits of the common species, *Celeus castaneus* (Wagler), in Yucatan, as follows: "This bird has a very strong and peculiar odour, derived from its food, which consists exclusively of a small hymenopterous insect called the *Uss*. It is solitary, and lives in the deepest part of the forest. The specimens obtained were very tame and were watched for some hours before being shot; they jump nimbly about the trees, and are constantly catching the small insects which seem to be attracted to them by their odour."[1] I am informed by Mr. Miller that, according to Mr.

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[1] Quoted by A. Boucard, Proc. Zool. Soc. London, 1883, pp. 452–453.

G. K. Cherrie's observations made in Central America, the "hymenopterous insects" in question are ants.[1]

Phœnicothraupis rubicoides (Lafresnaye), one of the tanagers, is often credited with following swarms of ants in search of its food, as, for instance, by G. F. Gaumer[2] from observations made in Yucatan and by C. C. Nutting[3] in Nicaragua. The latter remarks: "Curiously enough, although a tanager, this bird is usually seen clinging to the tree-trunks, like the Dendrocolaptidæ, and hops about the ground like the Formicariidæ. Indeed it seemed to be living almost entirely upon ants. There were many places where the ground was actually swarming with these insects, and there *P. rubicoides* would congregate in large numbers, either picking up the ants from the ground, or climbing about the trunks of trees in pursuit of the same insect."

Eucometis spodocephala (Bonaparte), another tanager, and *Dendrocincla sancti-thomæ* (Lafresnaye), one of the Dendrocolaptidæ, were also seen by C. C. Nutting in Nicaragua, feeding largely upon ants (*op. cit.*, pp. 382 and 385).[4]

It is especially the Neotropical ant-thrushes, or Formicariidæ, that have been credited with habitually following the columns of the foraging ants (Ecitonini) in much the same manner as will later be described for the African ant-thrushes and doryline ants. R. Schomburgk[5] mentions that, in British Guiana, the moving armies of *Eciton* are always accompanied by large numbers of several species of birds, the most common of these being *Formicarius colma* (Boddaert) and *Pithys albifrons* (Linnæus). This traveller evidently believed that the birds were feeding on the ants themselves. H. W. Bates, speaking of his experiences with the foraging ants in Brazil, also writes that "when the pedestrian falls in with a train of these ants, the first signal given him is a twittering and restless movement of small flocks of plain-colored birds (ant-thrushes) in the jungle."[6] Belt's observations in Nicaragua are somewhat similar: "The numerous birds that accompany the army ants (*Eciton prædator*) are ever on the lookout for any insect that may fly up, and the heavy flying locusts, grasshoppers, and cockroaches have no chance of escape. Several species of ant-thrushes always accompany the army ants in the forest. They do not, however, feed on the ants, but on the insects they disturb. Besides the ant-thrushes, trogons, creepers, and a variety of other birds, are often seen on the branches of trees above where an ant army is foraging below, pursuing and catching the insects that fly up."[1] It does not appear, however, that the food of the Formicariidæ has often been determined from actual examination of the stomach contents of these birds.

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[1] Lüderwaldt (1909, Zeitschr Wiss Insektenbiol., V, p. 312) tells that the Campos woodpecker [*Colaptes? campestris* (Vieillot)] ransacks the ground nests of *Camponotus rufipes* (Fabricius) in southern Brazil

[2] Quoted by A. Boucard, Proc. Zool. Soc. London, 1883, p. 443.

[3] 1883, Proc. U. S. Nat. Mus., VI, No. 24, p. 382.

[4] None of the few stomachs of *Phœnicothraupis* and *Dendrocincla* from Nicaragua examined by Mr. Miller contained ants.

[5] Schomburgk, R., 1848, 'Reisen in Britisch-Guiana,' (Leipzig), II, pp. 287–288 and 421.

[6] 1863, 'The naturalist on the River Amazon,' (London), II, p. 357.

During his sojourn in Africa with the American Museum Congo Expedition, my friend Mr. J. P. Chapin made accurate investigations as to the food of birds, examining the stomach and crop contents of most of the specimens collected by him. He has kindly allowed me to use his observations, and some of his field notes are quoted in full below. Of about 6000 Congo birds examined by him in this respect, some 200, belonging to about 85 or 90 species, had included ants in their diet.

In the following account I have grouped the African ant-eating birds according to the interest they show in this kind of food and the manner in which they procure it. Data heretofore published bearing on the subject have been referred to, in so far as I have been able to ascertain in the extensive literature on African ornithology; in this, too, I have been very effectively aided by Mr. Chapin.

1.—In a first group may be placed birds that feed occasionally or accidentally on ants, without, however, showing much preference for this kind of diet. A great number, if not all, of the African insectivorous and omnivorous species should perhaps be included here; for most of them available records merely give "insects" in general as food. The following are the only species for which ants have been expressly mentioned as part of the diet.

Glareola fusca (Linnæus), according to v. Heuglin,[2] in Nubia pursues swarms of winged ants in the evening, as do other species of *Glareola*.

Sarciophorus superciliosus (Reichenow). Zech, in Togo, found ants in the stomachs.[3]

Œdicnemus œdicnemus (Linnæus), according to v. Heuglin,[4] feeds partly on ants in Nubia.

Abdimia abdimi (Lichtenstein) eats even ants, according to Hartmann,[5] and G. K. Marshall[6] in Rhodesia found, in the stomach of this stork, beetles and "ants of the genus *Carebara*" (probably of the winged, sexual phases.)

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[1] 1874, 'The naturalist in Nicaragua,' (London), p. 20
[2] Heuglin, T. v., 1873, 'Ornithologie Nordost-Afrika's,' (Cassel), II, p. 982.
[3] Quoted by Reichenow, A., 1901, 'Die Vögel Afrikas,' (Neudamm), I, p. 191
[4] Heuglin, T. v., 1873, *op. cit.*, II, p. 988.
[5] Quoted by Heuglin, T. v., 1873, *op. cit.*, II, p. 1104
[6] 1902, Trans. Ent. Soc. London, p. 350

Melierax canorus (Rislach). The stomachs examined by Oates, in Transvaal, contained large ants, rats and lizards.[1]

Falco concolor Temminck. Antinori observed in Eritrea flocks of this bird hunting winged ants (perhaps termites?).[2]

Pogoniulus pusillus uropygialis (Heuglin). v. Heuglin[3] found some ants among the stomach contents of this bird in Nubia.

Irrisor senegalensis (Vieillot), according to v. Heuglin,[4] eats ants among other insects in Nubia.

Batis orientalis (Heuglin). G. W. Bury noted, for a specimen collected in Northern Somaliland, that "the stomach was found to contain a large number of ants."[5]

Batis molitor (Hahn and Küster). Insects of various kinds, also ants, in the stomachs of Gazaland specimens.[6]

Laniarius erythrogaster (Cretzschmar), according to v. Heuglin,[7] eats ants among other insects in Nubia.

Ploceus aureoflavus A. Smith. Fischer[8] found in the stomach of this weaver-bird, in British East Africa, seeds and sometimes also ants and caterpillars.

Nectarinia arturi Sclater. The crops examined by Swynnerton,[9] in Gazaland, contained flying ants, small flies and several large gnats.

Chalcomitra kirki (Shelley). The crop of one bird examined in Gazaland by Swynnerton[10] contained beetles and ants.

Tarsiger stellatus (Vieillot). The crops of two specimens examined in Gazaland by Swynnerton[11] contained berries, various insects and ants.

Muscicapa cœrulescens (Hartlaub). Large black ants and beetles were found in the stomach of a specimen taken in Gazaland by Swynnerton.[11]

At Salisbury, Rhodesia, G. K. Marshall[12] found remains of ants in the stomachs of the following birds:

Bradornis mariquensis (A. Smith).
Pratincola torquata (Linnæus).

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[1] Oates, F., 1881, 'Matabele Land and the Victoria Falls,' (London), p. 298.
[2] Antinori, O. and Salvadori, T., 1873, Ann. Mus. Civ. Genova, IV, p. 389.
[3] Heuglin, T. v., 1871, *op. cit.*, I, p. 762.
[4] 1869, *op. cit.*, I, p. 216
[5] Bannerman, 1910, Ibis, (9) IV, p. 312.
[6] Swynnerton, 1907, Ibis, (9) I, p. 70
[7] Heuglin, T. v., 1871, *op. cit.*, I, p. 464
[8] Quoted by Reichenow, A., 1904, 'Die Vogel Afrikas,' (Neudamm), III, p. 92.
[9] 1907, Ibis, (9) I, p. 42.
[10] *Op. cit.*, p. 43.
[11] *Op. cit.*, p. 67.
[12] 1902, Trans. Ent. Soc. London, p. 351.

Monticola angolensis niassæ Reichenow.
Saxicola pileata (Gmelin).
Dicrurus adsimilis divaricatus (Lichtenstein).
Thamnolæa cinnamomeiventris (Lafresnaye).
Crateropus jardinei kirkii Sharpe.
Lophoceros leucomelas (Lichtenstein).
Campothera bennetti (A. Smith).
Crecopsis egregia (Peters).

From Mr. Chapin's observations it appears that in the Belgian Congo swallows [*Riparia riparia* (Linnæus) and *Psalidoprocne nitens centralis* Neumann],[1] *Coracina pectoralis* (Jard. Selby), shrikes [*Nilaus afer* (Latham), *Corvinella corvina* (Shaw)], and certain kingfishers (*Halcyon pallidiventris* Cabanis) are very fond of catching sexual winged ants together with other flying insects, while francolins (*Francolinus lathami* Hartlaub, *F. squamatus* Cassin, *F. icterorhynchus* Heuglin) and Guinea fowl (*Guttera plumifera schubotzi* Reichenow, *G. pallasi* Stone, *Phasidus niger* Cassin, *Numida ptilorhyncha* Lesson) often indiscriminately pick up worker ants from the ground with snails, beetles, seeds, and even pebbles. With regard to the two species of forest Guinea fowl, Mr. Chapin remarks that their flesh "is rather dry eating and has, in addition, a peculiar strong taste, due probably to something they eat, possibly the ants usually found in their crop." At Ngayu the crop and stomach of a black forest Guinea fowl, *Phasidus niger*, were filled with thick green leaves and driver ants. In the case of the savannah Guinea fowl, *Numida ptilorhyncha major* Hartlaub, ants were frequently found in the crop; usually, as in a specimen examined at Faradje in September 1911, these ants belonged to the large, black, termite-hunting species, *Megaponera fœtens* (Fabricius).

The following list contains the birds from the Belgian Congo which showed remains of ants in their stomachs. In most cases these insects were present only in small numbers, or the individuals taken belonged to the winged phases. In some of the pipits (*Anthus*) and thrushes (*Thamnolæa* and *Monticola*), however, worker ants and even their larvæ were sometimes present in large quantities; it is possible that these birds, and perhaps others in the list, may prove on further observation to be rather regular ant-feeders.

Glareola melanoptera Nordmann.
Galachrysia nuchalis emini (Shelley).
Neotis denhami (Children).
Himantornis hæmatopus whitesidei Sharpe.
Ciconia ciconia (Linnæus).
Coturnix coturnix (Linnæus).

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[1] In a specimen of *Hirundo nigrita* G. R. Gray, from Gamangui, Mr. Chapin found that "the right metatarsus had been bitten by a driver ant, whose head still adhered to it, and all the lower part of the foot had died and dried up, without falling off."

Coturnix delegorguei Delegorgue.
Milvus ægyptius parasitus (Daudin).
Centropus grillii Hartlaub.
Cuculus solitarius Stephens.
Cuculus jacksoni Sharpe.
Lybius guifsobalito Hermann.
Coracias abyssinicus **Hermann.**
Eurystomus afer (Latham).
Eurystomus gularis Vieillot.
Bucorvus abyssinicus (Boddaert).
Ceratogymna atrata (Temminck).
Bycanistes sharpei (Elliot).
Horizoceros granti (Hartlaub).
Irrisor erythrorynchos (Latham).
Scoptelus adolfi-friederici Reichenow.
Caprimulgus inornatus Heuglin.
Caprimulgus batesi Sharpe.
Macrodipteryx longipennis (Shaw).
Cosmetornis vexillarius (J. Gould).
Muscicapa striata (Pallas).
Stizorhina vulpina Reichenow.
Oriolus larvatus lætior Sharpe.
Onychognathus hartlaubi Hartlaub.
Hyphantornis cucullata feminina Grant.
Malimbus nitens microrhynchus **Reichenow.**
Pyromelana crassirostris Grant.
Estrilda atricapilla Verreaux.
Melanopteryx nigerrimus (Vieillot).
Parmoptila jamesoni (Shelley).
Anthus leucophrys gouldi Fraser.
Pycnonotus tricolor (Hartlaub).
Cinnyris superbus (Shaw).
Cinnyris splendidus Shaw.
Hedydipna platura (Vieillot).
Eremomela badiceps (Fraser).
Monticola saxatilis (Linnæus).
Thamnolæa nigra (Vieillot).

In the case of the weaver-birds included in the above list, it is evident that some of the species (*Parmoptila*, *Malimbus*, *Estrilda*, etc.) have a marked predilection for ants, since the crop and stomach very often contained their larvæ, pupæ, and workers. Mr. Chapin's note concerning a *Melanopteryx nigerrimus* obtained at Avakubi is worthy of quotation: "its stomach contained many of the large light brown ants[1] that bind together the leaves of mango, as well as those of other trees, with silky fibers produced by their larvæ."

2.—Birds that feed chiefly or to a very large extent on ants are of more interest to the myrmecologist, and some of them have developed peculiar habits in connection with this kind of diet.

a.—Swifts and bee-eaters seem to show, in tropical Africa, a marked preference for ants in the winged phases, which they catch in flight. The stomach of one of the most common swifts, *Micropus apus* (Linnæus), was frequently found by Mr. Chapin to be filled with brownish-black winged ants; many other species, such as *Micropus streubeli* (Hartlaub), *M. affinis* (Gray and Hardwicke), *Tachornis parvus* (Lichtenstein), *Chætura cassini* Sclater, *C. ussheri sharpei* Neumann, *C. sabini* Gray, and *C. melanopygia* Chapin, have similar habits. Mr. Chapin observes that swifts feed mainly on winged ants, while swallows catch them only occasionally. The red-breasted bee-eater, *Merops*

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[1] ***Œcophylla longinoda*** **(Latreille). [J. B.]**

malimbicus Shaw,[1] also shows a great predilection for winged ants; in the eight specimens shot near Monsembe, on the Congo River, from a flock of 175 to 200 which was resting in the top of a dead tree, the gizzard was well filled with such insects. Similar observations were made on related species at Avakubi (*Merops albicollis* Vieillot) and Bafwabaka [*Melittophagus mülleri* (Cassin)].

b.—A rather small group of insectivorous birds attack the nests of ants and feed on the workers as well as on the brood. This is a very common habit with many species of woodpeckers. Sjöstedt[2] relates that some of the Cameroon species seem to live chiefly on ants, which were the only insects he found in the stomach of *Campethera permista* (Reichenow). Kersting[3] found ants in the stomach of *Campethera nivosa* (Swainson) and v. Heuglin[4] in that of *Mesopicus schoensis* (Rüppell) and *Dendropicos obsoletus* (Wagler), brood as well as worker ants being present. Similar observations were made by Mr. Chapin on the following Congo species: *Campethera caroli* (Malherbe), *C. permista* (Reichenow), *C. balia* Heuglin, *C. abingoni chrysura* (Swainson), and *C. nivosa* (Swainson). His following note relates to a specimen of the last-named species from Avakubi: "the stomach contained larvæ and pupæ of a very small black ant that builds large brown nests in the trees.[5] From this it would seem that this woodpecker had been pecking holes in a nest."

A specimen of *Campethera abingoni* (A. Smith) obtained by Swynnerton[6] in Gazaland had its stomach filled with hundreds of a small black tree-ant in all stages of development.

c.—Some birds of the African forests have developed the curious habit of following the columns of doryline driver ants, much as do the South American Formicariidæ I have previously mentioned. The earliest observations of the kind were made by Du Chaillu[7] in the Gaboon: "Hunting in the rear of the village (of Obindji) on the 15th [of April 1858], I shot a curious bird, the *Alethe castanea*—a new species. . . They fly in a small flock, and follow industriously the bashikoway ants [driver ants] in their marches about the country. The bird is insectivorous; and when the bashikoway army routs before it the frightened grasshoppers and beetles, the bird, like a regular camp-follower, pounces on the prey and carries it off. I think it does not eat the bashikoway."

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[1] Hartert found winged ants, together with other insects, in the stomach of *Merops malimbicus* examined by him in Nigeria (1886, Journ. f. Ornithol., XXXIV, p. 593).

[2] 1895, Kongl. Svenska Vetensk. Ak. Handl., N. S., XXVII, No. 1, pp. 54 and 56.

[3] Quoted by Reichenow, A., 1903, 'Die Vögel Afrikas,' (Neudamm), II, p. 170.

[4] Heuglin, T. v., 1871, 'Ornithologie Nordost-Afrikas,' (Cassel), I, p. 804 and 810.

[5] Evidently a species of *Crematogaster*. [J. B.]

[6] 1907, Ibis, (9) I, p. 290.

[7] Du Chaillu, P. B., 1861, 'Explorations and adventures in equatorial Africa,' (New York), p. 319.

Reichenow[1] made similar observations on the same species of bird in Cameroon, but he found the stomachs of specimens examined by him filled with driver ants. He also claims that *Turdinus fulvescens* (Cassin) has similar habits.[2] According to Sjöstedt,[3] the following birds are found near the moving columns of *Dorylus* (*Anomma*) *nigricans* subspecies *arcens* in Cameroon: *Bleda notata* (Cassin), *B. syndactyla* (Swainson), *Alethe castanea* Cassin, *Criniger calurus* (Cassin), and *Neocossyphus poensis* (Strickland). This observer notes that *Bleda notata* on such occasions does not remain on the ground, but rather on the lower branches of trees and shrubs, whence it jumps down to the ants and returns at once to its perch. The stomach of *Neocossyphus poensis* was found to contain ants only, while that of *Bleda notata* contained ants and beetles. At Efulen, Cameroon, G. L. Bates[4] also saw *Alethe castanea* "in thickets where an army of driver ants covers the ground and bushes, as they are very fond of feeding on these ants, though they do not come into open places to do so." In another paper, Bates[5] writes: "Whenever you see a number of birds of different kinds flitting about near the ground in one place and twittering excitedly, you may be pretty sure there is an army of 'driver ants' at hand. Many different kinds of birds join in the chase of driver ants. I have even seen the small white-crested hornbill (*Lophoceros hartlaubi*) engaged in it." Another hornbill, *Ortholophus cassini* Finsch, was once seen by Bates[6] to join with smaller birds in pecking at a swarm of driver ants on the ground.

On Mount Ruwenzori, between 6500 and 9000 feet, R. B. Woosnam found *Alethe poliophrys* Sharpe "frequenting the forest zone and the lower edge of the bamboo. It appeared to be particularly fond of the soldier ants and might often be seen attacking a column of these insects as they crossed a path or open spot. Whether it really ate the ants or merely snatched away the eggs they were carrying, was a point we could never decide; probably the eggs were the attraction, for it seems difficult to imagine anything more unsatisfactory than a meal of angry soldier ants."[7]

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[1] 1875, Journ. f. Ornithol., XXIII, p. 29.

[2] Mr. Chapin did not find this to be the case with *T. fulvescens* in the Upper Congo.

[3] Sjöstedt, Y., 1895, 'Zur Ornithologie Kameruns,' Kongl. Svenska Vetensk. Ak. Handl., N. S., XXVII, No. 1, pp. 1–120, Pls. I–X. In a later paper Sjöstedt further mentions certain woodpeckers of the genus *Campethera* and *Stiphrornis gabonensis* Sharpe as occasionally following the columns of the dorylines in Cameroon, though not so regularly as the *Criniger* and *Alethe* ('Exped. Kilimandjaro, Meru, etc.,' II, 8, 1908, p. 111).

[4] Quoted by R. B. Sharpe, 1908, Ibis, (9) II, p. 128.

[5] Quoted by R. B. Sharpe, 1904, Ibis, (8) IV, p. 92.

[6] 1905, Ibis, (8) V, p. 89. Under the name *Ortholophus albocristatus* (Cassin).

[7] Woosnam, quoted by O. Grant, 1910, Trans. Zool. Soc. London, XIX, p. 374.

In his account of the columns of *Dorylus* in Gazaland, South East Rhodesia, Swynnerton[1] has the following remarks: "I have also on a few occasions watched birds attending *Dorylus*, to rob stragglers of their prey, and for the sake of the flying and hopping insects flushed by the ants. Some of the birds on occasion eat the ants themselves. In my experiments on many species of insectivorous birds, I found that some ate ants generally, including *Dorylus*, far more readily than others. Of these others some showed a strong repugnance to them, and it is doubtless in relation to this latter class of enemy, that ant-mimicry finds its main use. Yet even the birds that prey on ants show caution in attacking *Dorylus* in column, merely (in my observations) dropping down to stragglers and hastily returning to their perch." It would be interesting to know which species of birds in South Africa have acquired these habits, since most of the true ant-thrushes are more at home in the West African forest region.

In the forest of the Belgian Congo, Mr. Chapin found the following birds associated with the armies of Dorylinæ: *Alethe castanea woosnami* Grant, *A. poliocephala carruthersi* Grant, *Bleda eximia ugandæ* van Someren, *B. syndactyla woosnami* Grant, *Neocossyphus rufus gabunensis* Neumann, *N. poensis præpectoralis* Jackson.[2] Several of these species occur together, as indicated in the following field-note written at Avakubi, April 16, 1914: "We came to a spot in the forest this morning where a great number of driver ants were crossing the road in several columns; and, noticing that there were also birds on hand, we stopped for some time to watch the proceedings. Besides a half-dozen small brown thrushes (*Alethe*, mostly *A. c. woosnami*, but also one or two *A. p. carruthersi*), there were two rufous thrushes (*Neocossyphus rufus gabunensis*), at least one with white patches in the tail (*Neocossyphus p. præpectoralis*) and one *Bleda s. woosnami*. It was quite evident that all these birds were attracted by the ants, and they seemed especially interested in a spot where these irritable insects had spread out widely over the path. The *Alethe* were, of course, most in evidence, fluttering back and forth across the road, occasionally darting down right among the ants, and perching in the bushes bordering the way. *Alethe c. woosnami* has a habit of fluttering its wings slightly, like a bluebird, while perching. From time to time one of the larger rufous thrushes would fly out of the undergrowth, sometimes even alighting on the ground amid the ants, but, as usual.

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[1] 1916, Trans. Ent. Soc. London, (1915), p. 318.

[2] It may be remarked that these African "ant-thrushes" are not all related forms, for, while *Alethe* and *Neocossyphus* belong to the Turdidæ, *Bleda* is placed among the Pycnonotidæ.

these birds were very shy and it was only after long waiting that I could shoot one.

"Now, what are the birds after? It is not, as a rule, the adult ants, for these are generally only eaten, if at all, in very small numbers. Nor is it their young, for they frequently do not carry any, and this circumstance has no relation to the presence or absence of birds. Is it the victims—other insects and the like—being carried by the ants? Surely there ought to be easier ways than this to procure the same food. Yet the three ant heads in the stomach of one of the *Neocossyphus rufus* might have come there in that way. Seizing some coveted morsel, the bird found, perhaps, that several ants had buried their jaws in it, but plucked off their bodies at, any rate, before eating it."[1] On another occasion, at Bafwabaka, the stomach of an immature *Neocossyphus p. præpectoralis* was found filled with driver ants; but in most of the other "ant-thrushes" examined for this purpose the food consisted mostly of small insects, with occasionally a driver ant. A number of stomachs of *Alethe* also contained the bones of small frogs.

Plate I (frontispiece) represents a typical association of three driver ant birds commonly found in the Ituri Forest following the columns of the dorylines: *Alethe c. woosnami* Grant, *Neocossyphus rufus gabunensis* Neumann, and *Bleda eximia ugandæ* van Someren.

MAMMALS

That many insectivorous and omnivorous mammals, such as moles, shrews, monkeys, and the like, will at times feed on ants can be expected after what we have learned above of the feeding habits of insectivorous birds; we know, however, but little about this from actual observation. We have the authority of John Muir that certain North American black bears are very fond of carpenter ants (*Camponotus*); they "tear and gnaw their home logs to pieces, and roughly devour the eggs, larvæ, parent ants, and the rotten or sound wood of the cells, all in one spicy acid hash."[2] Mr. C. L. Camp has kindly informed me that he once saw in the Yosemite National Park, California, bear-droppings containing masses of the chitinous remains of ants. Moles, too, must devour large numbers of worker ants and their pupæ, though I have found no definite records thereof, except in the case of the American mole, *Scalopus aquaticus* (Linnæus). Scheffer[1] has examined one hundred stomachs of this animal in Kansas and found remains of ants in nineteen ot them, these insects being then, as a rule, present in large numbers; one of the stomachs, for instance, contained 205 ants and 44 other insects; another, 250 ant puparia and 6 other arthropods.

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[1] Mr. Chapin also notes that, at Faradje, he once watched a chicken eating army ants.

[2] Muir, J., 1916, 'My first summer in the Sierra,' (Boston and New York), p. 46. C. H. Merriam (1884, 'The mammals of the Adirondack Region,' New York, p. 95) writes that the American black bear (*Ursus americanus* Pallas) "is *par excellence* an omnivorous beast, and his larder consists not only of mice and other small mammals, turtles, frogs, and fish, but also, and largely, of ants and their eggs, bees and their honey, cherries, blackberries, raspberries, blueberries and various other fruits, vegetables, and roots. . . . He delights in tearing open old stumps and logs in search of the ants that make their homes in such situations."

So-called "ant-eaters" are found in practically all tropical regions, but the confusion so commonly made by casual observers between the true ants (Formicidæ) and the "white ants," or termites, in many cases makes it hard to decide from published accounts which of these mammals are truly myrmecophagous and to what extent. Moreover, but little information based on actual study has been published concerning their feeding habits and stomach contents. White ants, or termites, constitute, of course, an attractive food for almost every insectivorous animal, while true ants, as Beebe remarks, "are all flavored more or less strongly with formic acid, and must be an acquired taste."[2] Further interesting questions which cannot be answered at this time are whether the various ant-eaters prefer ants to other insects and whether they can make a selection between different species of ants. These points would be of importançe in considering the possible use of these animals to combat the leaf-cutting ants of tropical America, as suggested by certain observers.

The echidnas, or spiny ant-eaters (*Echidna aculeata* Shaw and allies), of New Guinea, Tasmania, and Australia belong to the order Monotremata and are among the most primitive and odd-looking of present-day mammals. The Australian species, at least, is said by most observers to feed on "ants," though from the descriptions of G. Bennett[3] and Saville Kent it would appear that by this termites are meant as well as Formicidæ. Saville Kent, for instance, writes that when the echidnas are placed in contiguity to a teeming ant track, they take no notice of it, "appreciating the insects only under the conditions obtaining in the nests or hillocks. These edifices they would soon tear open with their powerful claws, exposing to view the white succulent nymphs, larvæ, and pupæ, or so-called eggs, upon which alone they concentrated their attention."[4]

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[1] Scheffer, T. H., 1910, 'The common mole.' Bull. 168 Kansas State Agric. Coll. Exper. Stat., pp. 1-36. 1914, 'The common mole of the Eastern United States', U. S. Dept. Agric. Farmers Bull. 583, pp. 1-10. See also West, J. A., 1910, 'A Study of the food of moles in Illinois,' Bull. Illinois St. Lab. Nat. Hist., IX, 2, pp. 14-22.

[2] 1918, Bull. Zool. Soc. New York, XXI, No. 1, p. 1561.

[3] Bennett, G., 1860, 'Gatherings of a naturalist in Australasia,' (London), pp. 147-150.

[4] 1897, 'The naturalist in Australia,' (London), p. 19

The echidna is chiefly nocturnal and shows many remarkable adaptations to its habit of feeding on subterranean insects. The face is drawn out into a long, tapering, cylindrical snout, terminating in a very small mouth. The tongue is elongated, very slender, and capable of being protruded for a considerable distance. The jaws are slender and entirely destitute of any kind of teeth, of which, moreover, no trace has been found in the young. The palate, however, and the back of the tongue are rough with small spines, presumably to hold the living prey. "For ants and their eggs form the staple food, and these the *Echidna* obtains by digging up the ant or termites' nests with its powerful limbs. Then the tongue covered with a sticky saliva is protruded; it becomes covered with ants, and is then quickly drawn back into the mouth."[1]

More circumstantial evidence concerning the food of the echidnas in Queensland is to be found in a short note by Bennett's son:

> They are particularly partial to the white ants, which erect small mounds of clay about 18 inches in height. These they attack in a most systematic way, by working round the nest, by clearing away the earth and forming a trench where the nest joins the earth, and devouring all before them; and then they make a hole in the center and clear out the whole nest, leaving none behind to tell the tale of their visit. The soldier ant (a large stinging ant) they do not touch; their nests were close to the white ant mounds, but were untouched. The larger sugar ants, which raise mounds of sand about 16 inches high and 4 feet in diameter, they attack first, by lying on the mound with their tongue out and drawing in the ants that cross it; there they remain sometimes for hours. This, I have no doubt, is the time that they get the sand found in their stomach. They then make a hole from one side to the other, and devour the most delicate morsels coming in their way. In the daytime they do not move about much, beginning their search about a couple of hours before sundown.[2]

K. Dahl[3] also states that the Australian *Echidna aculeata* depends upon termites for its food.

Among the extensive order of marsupials, many of the insectivorous species must occasionally eat ants. One of them, the banded Australian ant-eater, *Myrmecobius fasciatus* Waterhouse, is often considered as belonging to a peculiar subfamily, the Myrmecobiinæ, and is said to feed on "ants" and perhaps also on other insects. This interesting animal offers, among the marsupials, all the adaptive characters of the South American ant-eaters: the elongate and pointed muzzle, the slender and extensive tongue, the stout fore limbs, and the long, curved, digging claws. In Western Australia, the stomach of one example proved upon dissection to be full of white ants, most of which had evidently been swallowed whole.[1]

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[1] Lucas, A. H. S. and Le Souef, W. H. D., 1909, 'The animals of Australia,' (Melbourne), p. 148.

[2] Bennett, G. J., 'Observations on the habits of the *Echidna hystrix* of Australia.' Proc. Zool. Soc. London, 1881, pp. 737–739.

[3] 1897, Zoologist, (4) I, p. 209. See also Konig, C., 1911, 'Der Ameisenegel.' Aus der Natur, VII, pp. 621–633.

There are several mammals formerly included in the heterogeneous "order" Edentata which are said to feed chiefly on "ants." In the case of the exclusively African aardvarks (*Orycteropus*; Pl. XXIV, fig. 1), I am assured by Mr. H. Lang, from his examination of stomach contents, that the regular food consists of termites, while true ants are only taken when they happen to occur in the termite mounds, as is frequently the case, and are then unintentionally swallowed together with the white ants. How far this is true also of the South American ant-eaters (Myrmecophagidæ, with the genera *Myrmecophaga*, *Tamandua*, and *Cyclopes*) remains uncertain; the available information does not go beyond the general statement that they feed on ants, termites, and their larvæ.

Concerning the great ant-eater or ant-bear, *Myrmecophaga tridactyla* Linnæus, Flower and Lydekker[2] say: "Its food consists mainly of termites, to obtain which it opens their nests with its powerful anterior claws, and as the insects swarm to the damaged part of their dwelling, it draws them into its mouth by means of its long, flexible, rapidly-moving tongue covered with glutinous saliva." That *Myrmecophaga* feeds on termites, and not on true ants, would also appear from the accounts given by H. W. Bates[3] and others. On the other hand, Hensel[4] maintains that the tamandua (*Tamandua tetradactyla* Linnæus) does not feed on termites, but that in all the specimens of that species examined by him the stomach was filled with true ants, even in localities where termite mounds were very common. His statements are, however, contradicted by A. Zietz[5] who fed the tamandua in captivity with termites, while ants were obstinately refused. The little, or two-toed, ant-eater (*Cyclopes didactylus* Linnæus) is an arboreal species which seems to feed chiefly on true ants. At least, Miss Snethlage[6] was unable to feed it in captivity with termites; she says that not all ants are to its taste; the pupæ of a species which lives in dry imbauba trunks are eaten with predilection, also the pupæ and workers of another small, black ant with triangular abdomen, found chiefly in inga trees.

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[1] G. C. Shortridge, quoted by O. Thomas, Proc. Zool. Soc. London, 1905, II, p. 772.

[2] Flower, W. H. and Lydekker, R., 1891. 'An introduction to the study of mammals living and extinct,' (London), p. 191.

[3] 1863. 'The naturalist on the River Amazon,' II, pp. 178–179. Nill (1907, Zoolog. Beobachter, XLVIII, pp. 145–151) fed *Myrmecophaga jubata* in captivity on red ants (*Formica rufa*), which the animal would take through the neck of a bottle.

[4] Der Zoolog. Garten, Frankfurt a.M., 1872, p. 177.

[5] Der Zoolog. Garten, Frankfurt a.M., 1872, pp. 301–304.

[6] Quoted by Strassen in Brehm's 'Tierleben,' 4th Ed., Saugetiere,' I, 1912, p. 544.

The armadillos (Dasypodidæ), which range in many species over the tropical and temperate parts of South America, one of them even reaching Texas, are said to be omnivorous, feeding on roots, insects, worms, reptiles, and carrion; in how far this diet may include true ants is by no means easy to gather from the very scanty descriptions of the habits of these animals; in many cases termites are in all probability the chief food.[1] The snout of the armadillos is moderately elongate, and the tongue is long, pointed, extensile, though less so than in the Myrmecophagidæ.

It would thus appear that the pangolins or scaly ant-eaters (Manidæ; Pl. XXIV, fig. 2; Pl. XXV, figs. 1 and 2) of the Old World tropics are the only edentates whose myrmecophagous propensities are beyond doubt. These animals are at once recognizable by the large overlapping scales which cover the whole of the upper surface of the head, the upper surface and sides of the body, the whole of the tail, and the outer sides of the limbs; the legs are short and end in curved claws, those of the fore limbs being especially powerful. The snout is pointed and conical; teeth are entirely absent; the long, vermiform, protractile tongue is flattened toward the tip and kept sticky with saliva abundantly produced by enormous submaxillary glands. The structure of the stomach shows further curious adaptations to their ant diet; in *Manis javanica*, for instance, most of the mucous membrane is transformed into a pavement epithelium of horny texture, raised into folds in the cardiac region near the œsophagus, while it forms horny teeth in the pyloric part, at the end of the great curve; opposite these pyloric teeth, at the end of the small curve, the middle line is swollen into an organ of trituration, covered with numerous horny teeth and moved by powerful underlying muscles. The gastric glands are united into a few voluminous glandular bodies which pour their abundant secretion into the stomach by way of wide glandular ducts. The insects are swallowed whole and reach the stomach together with saliva, sand, and small pebbles often as large as a pea; this mixture is then ground up by the peristaltic movements of the stomach, whose inner walls are effectively protected by the horny pavement epithelium; gastric juice is profusely poured over the stomach contents, which undergo a final grinding by the organ of trituration in the pyloric region.[2]

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[1] Luderwaldt (1909, Zeitschr. Wiss. Insektenbiol., V, p. 312) mentions incidentally that the armadillos in Brazil prefer to grub about in the earthen mounds of the stinging *Solenopsis geminata*.

[2] See Weber, M., 1904, 'Die Säugetiere,' (Jena), pp. 426–427.

Seven species are now generally recognized in this family and are all included in the genus *Manis:* four of these occur on the African continent, while the remaining three are found in the Oriental Region (Ceylon, India, Burma, southern China as far as Kianghsi, Formosa, and Sunda Islands). The ant-eating habit is common to all, though it has been investigated in only a very general way. I have been able to find but one record of the complete analysis of the stomach contents of one of these animals. It was made from a specimen of *Manis* (said to have been *temmincki*, but probably *gigantea* Illiger), the stomach of which was sent by Solon from the Lower Congo to Forel, who extracted from it the following ants,[1] several of which were at that time new to science.

Dorylus (*Anomma*) *emeryi* subsp. *opacus* Forel. Numerous workers.

Pheidole punctulata Mayr. Several workers and two soldiers.

Crematogaster impressa Emery. Very numerous workers and several males.

Macromischoides aculeata (Mayr). A few workers.

Myrmicaria eumenoides var. *congolensis* Forel. Very numerous workers.

Rhoptromyrmex opacus var. *estus* Forel. Very numerous workers, a number of males and a few females.

Plagiolepis tenella Santschi. Female.

Œcophylla longinoda (Latreille). Workers.

Polyrhachys concava André. A small number of workers.

Camponotus manidis Forel. A small number of workers.

Camponotus foraminosus subsp. *delagoensis* var. *sorptus* Forel. A very large number of workers, a goodly number of females and several males.

Büttikofer,[2] in Liberia, fed the smaller, arboreal species, *Manis longicaudata*, with larvæ taken from mushroom-shaped termite nests. Of the large, terrestrial *Manis gigantea*, he says that the anterior portion of the stomach of a specimen contained about six liters of termites, while the posterior portion was filled with an equal amount of driver ants. Vosseler[3] found that the excrement of a *Manis temmincki* Smuts which he observed alive at Amani in Usambara consisted entirely of the chitinous remains of driver ants.

The habits of the oriental species of the genus should not materially differ from those of their African relatives. Kreyenberg,[4] who observed *Manis javanica* in China, states that all stomachs examined by him contained large numbers of ants and their larvæ exclusively. And speaking of the same species in Borneo, Beebe[5] writes: "Ants, both stinging and harmless, form the entire food, although we must extend this general term to include the neuropterous white ants or termites. I have counted five hundred fire ants in the gizzard of a pangolin, their bites and stings powerless against the sticky, merciless tongue which played and played again among them, each time sweeping away scores. Lacking teeth, the creature swallows tiny pebbles which, as in a chicken, aid in crushing the hard bodies of the ants."

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[1] 1909, Ann. Soc. Ent. Belgique, LIII, pp. 58–63.

[2] Büttikofer, J., 1890, 'Reisebilder aus Liberia,' (Leiden), II, pp. 393–395.

[3] 1907, Zoolog. Beobachter, XLVIII, p. 197.

[4] 1907, Zoolog. Beobachter, XLVIII, p. 184.

[5] Beebe, C. W., 1914, 'The pangolin or scaly anteater,' Zool. Soc. Bull. New York, XVII, pp. 1141–1145.

The following notes on ant-eating mammals in the Belgian Congo have been contributed by Mr. Herbert Lang.

"The scaly ant-eaters (Manidæ), or pangolins, are distributed over southern Asia, part of the Malay Archipelago, and Africa. Those of the Ethiopian Region frequent chiefly the wooded portions where hiding is rendered easy and in the Savannah Province their distribution coincides with the forest galleries. During the day they rest, slightly rolled-up and concealed in any suitable shelter, thus escaping observation. The terrestrial forms usually dig their own retreat. The signs of their fossorial practice are as often a cause of their discovery as is the strong odor they emit, and dogs of native hunters never fail to challenge their presence. Various highly valued talismans, which their captors obtain from the claws, scales, hairs, and other parts of some of the scaly ant-eaters, suffice to make them an always welcome prize and their meat is an additional incentive for their destruction.

"The giants among living Manidæ are found only in Africa and are represented by two closely related forms. Of these, *M. temmincki* Smuts is apparently restricted to the southern and eastern portions of the Ethiopian Region and *M. gigantea* Illiger (Pl. XXIV, fig. 2; Pl. XXV, fig. 2) to the western parts. The two other, much smaller, species occur only in the West African Forest Province, though the rarer, long-tailed *M. tetradactyla* Linnæus (Pl. XXV, fig. 1) alone is truly arboreal. The most common and smallest of these ant-eaters, *M. tricuspis* Rafinesque, is also an excellent climber, but more frequently remains near the ground. It reaches a length of about three feet, less of two-thirds of which are taken by the tail. In *M. tetradactyla*, the tail is proportionally longer.

"The African scaly ant-eaters generally appear so sluggish as to detract much from the interest they otherwise might arouse. Being timid, they readily make use of their natural safeguard and, when even slightly annoyed, roll up in a ball cinched by the grip of the strong, muscular tail. *M. tricuspis* and *M. tetradactyla* often hook the tip over the reclined dorsal scales, thus closing up very tightly and sometimes so fast that one has to be careful not to have a finger caught between the scales. When forcibly unrolled, they may succeed in driving off their tormentors by well directed jets of an ill-smelling, acrid liquid from the anal region; native dogs suffer for a considerable time from the effect of this substance, which greatly irritates their mucous membranes. The sharp claws, however, are not used at all for defense, though in a struggle they may inflict severe wounds.

"In spite of their timid ways, these animals are not really shy, for, if unmolested and placed near their favored prey, they uncoil readily and, not minding the presence of man, surprise by their agility even more than by their cleverness. One soon realizes how thoroughly they are specialized as ant-eaters, for their methods of attack and disposal of ants are as effective as their ways of guarding themselves against the defensive means of their prey. In the regions we visited, the pangolins preferred true ants, as stomach contents clearly showed, though many of our captives would plunder termitaria with great eagerness. After opening the galleries of ants' nests they watched for a moment the infuriated masses swarming outside to defend their home, adjusted their position, and commenced feeding.

"The feeding process is assisted by many interesting adaptations. The strong, muscular fore limbs readily break into and tear apart the structures built by the tiny insects. Most of the ants that attempt to attack the pangolins are readily shaken off by a shivering movement of the scales. Other protective features are the moist snout; the easily closed, narrow nostrils; the thick, swollen-looking eyelids, acting like heavy pads over the small, globular eyes; and the practical absence of external ears, represented merely by muscular folds which shut the ear-opening at will. The mouth, even when fully opened, is but a narrow tube. The slender, slimy tongue shoots out and, well loaded, slips quickly back into its furrow. The food adhering to it is thus automatically pushed off and slides down into the stomach. Immediately the tongue, newly charged with slime, is thrown forward again and the performance continues with great rapidity. A huge gland, providing a steady supply of viscous matter, lies on either side of the throat and in *M. gigantea* attains the size of a goose egg. The furrow which accommodates the tongue and is so essential in removing the food and renewing its viscosity reaches far back into the thoracic cavity and carries with it the hyoid muscles. Their increased and altered function gives great importance to the sternoglossal muscles fastened upon the xiphisternal cartilage, which varies in extension in the different species. In the African and especially in the smaller arboreal forms it is more highly specialized. In *M. gigantea* it has the form of a loop, consisting of two, broad, band-like projections distally united and reaching back half the distance from sternum to pelvis. In *M. tricuspis* and *M. tetradactyla*, however, two rod-like, cartilaginous projections extend outside the peritoneum much farther back and, turning upward to the right, are loosely fastened to the last ribs. The prehensile tongue also acts as an organ of touch and, due to its shape, can follow the intricate turns and windings of the galleries in ant and termite structures. This explains why the inmates and their larvæ are cleaned out as by enchantment. An adult male *M. tricuspis* pushed its tongue into the galleries of a sectioned ant nest for a distance of four inches, moving it just as easily sideways as up or down. After making room to insert its tiny snout, it sniffed into the tunnel, thereby still more inciting the inhabitants that, hurrying to the place of disturbance, were then lapped up so rapidly that it was difficult to see how well loaded the tongue was as it shot back and forth.

"The prey is disposed of so instantaneously that neither the ejection of formic acid, the powerful, pinching mandibles, the armature of spines, nor even the stings of the ants are of much avail. The giant ant-eaters, with their broader, more ribbon-like tongue, are more deliberate than the smaller species in feeding, but their methods are equally efficient. From the behavior of various forms observed it appears that they are not affected by the defensive weapons of any of the ants they feed upon. Probably these insects have little chance to make effective use of them before they are enveloped in slime, and later the gastric juices and the triturating action of the stomach render any further efforts impossible.

"The variety of ants taken by these pangolins proves that taste alone does not guide them in their choice, and I have already mentioned that our captives fed on termites with the same eagerness. Furthermore, the food, covered with slime, passes through the completely toothless mouth and throat so quickly that flavor is perhaps of little or no importance. In fact, the passage from mouth to stomach might be compared to a chute, and a process replacing mastication begins only after the food reaches the stomach.

"In spite of this apparent immunity of the scaly ant-eaters, we found that certain kinds of ants are evidently not preyed upon by at least some of the pangolins. Near one of our camps at Avakubi there was a nest of robber ants (*Megaponera fœtens*). When we inserted a grass-stalk into its entrance, the owners hurried out to attack the intruder. In a very few moments a *Manis tricuspis* lying rolled-up nearby was overrun by the ants, which belabored it with their mandibles as well as with their painful stings. The pangolin became restless, unrolled by fits and starts, got to its feet, erected its scales, and hurried off to some distance. Then, again and again hooking its fore limbs into the ground, it dragged itself from spot to spot, at every pull exercising considerable pressure against the grass, thus endeavoring to free itself of the tormentors. Rolling up and unrolling and scratching with its claws exhausted its means of defense.

"Experiments with other captives of this species showed considerable variation in individual behavior. One taken near a column of army ants (*Dorylus*) merely made good its escape, another quickly broke up the well-ordered line. Sitting on its hind limbs and with its tail steadying its movements, the fore part of the body was swung about freely. The claws of the fore limbs were kept busy removing those of the fierce assailants that, in spite of the oft repeated shivering movements of the scaly armor, succeeded in gaining a hold. Lashing its sticky tongue through the confused crowds, the ant-eater lost no time in moving back and forth along the ant column as quickly as the dense clusters vanished into its mouth. Its hunger satisfied, it at once retreated, freeing itself of the few army ants that had managed to dig their mandibles into the soft parts of its hide. *M. tricuspis* fed freely on many other kinds of ants. Those we had alive at Avakubi, Medje, and Niapu were particularly fond of ants of the genus *Myrmicaria*. Brought within reach of such colonies, the pangolins always turned their attention to the deeper, open tunnels these ants construct across cleared spaces and trails. Here the steady stream of tiny travelers made their meals doubly easy. Curious was the habit of the ant-eaters, especially when sitting partly erect, of turning the outer edge of the tail down and suddenly sweeping into a heap all the fragments of ant or termite structures they had scattered about. This gave them a new chance of disposing of their victims that emerged again in numbers from the débris. Though undoubtedly nocturnal in habits, our captives had no objection to feeding during the day and only the direct rays of the sun interfered with the chances thus offered.

"While African pangolins have helped to enrich the stores of witchcraft both helpful and injurious, those of some parts of Japan, China, and Malaysia have furnished the folklore with a curious tale, slightly differing in details in the various regions, on their supposed feeding habits. According to the legend, the pangolin, after tearing open an ants' nest, erects its body scales and waits until as many ants as possible have crawled beneath them. Suddenly the scales are pressed down hard, crushing the tiny prey to death; the ant-eater then goes into the water, erects its scales, and proceeds to enjoy a meal of dead ants floating on the surface.

"However great their reputation for slowness, under certain conditions the African species seen could proceed in a shuffling manner for a short distance at the rate of eighty yards a minute, the giant species being slightly faster. All four limbs and the tail take an active part, but walking on hind limbs or leaping was not observed. They can sit erect, steadied by their strong tail and pillar-like hind limbs, thus enabling them to carry out any movement with the fore part of the body and greatly increasing their ability to dig and feed. In walking, *M. tricuspis* and *M. tetradactyla* held their claws in a normal position, the tip of the claws striking the ground. The giant pangolins, however, walk on the "knuckles" of the fore limbs, so to speak, the claws being folded beneath and slightly turned inward so that only the longer, outer curve of the claw touches the ground.

"The strong, prehensile tail of the smaller pangolins, *M. tetradactyla* and *M. tricuspis*, is provided on the lower surface of the tip with a rough skin pad of great tactile sensibility. By means of this the long tail can rapidly explore the neighborhood for possible means of progress. It can grasp firmly even the slightest projection, thus enabling these ant-eaters hanging upside down to plunder ants' nests even more easily than when sitting on a branch, for at any moment they can pull themselves out of reach of the attacking ants. By forcing the head up over the breast and belly they can hook the claws into their tail as into any nearby branch. These pangolins readily carry out a three-quarter twist with the forward part of the body, or turn back at a right angle to the surface on which they are climbing, and descend any slender tree or branch head downward by quickly shifting the grip of the prehensile tail.

"The smaller species, when suddenly frightened while climbing, may let themselves drop from any height, landing uninjured in a rolled-up condition, the flexible scales, backed by the resilient, strong panniculus carnosus, evidently absorb the shock. In the arboreal *M. tetradactyla*, the long tail, with its sharp-ridged and pointed scales on the under side, is dexterously used in getting about and often serves as stabilizer. As soon as the claws of the hind feet have gained firm hold in the bark the security of the position is greatly increased thereby. The body can then be bent even backward and the free fore limbs are put into action to widen the breach in the ant galleries as fast as the sticky tongue can empty them.

"The two giant species are terrestrial and fossorial in habits but are rather scarce. They alone have succeeded in holding their own over most of the Ethiopian Region. The Vaal-Orange River in the south and Abyssinia in the north are probably the limits of distribution for *M. temmincki*, and *M. gigantea* is known from the West African Rain Forest and the adjoining wooded galleries. The latter is the only large species we met in the Belgian Congo; specimens were taken at Bafuka, Niangara, Poko, and Niapu, the largest attaining five feet in length, the tail being less than half of this.

"Near the last-named place various burrows from which Pygmies had secured giant pangolins, both dead and alive, showed that the tunnels attain a length of fifteen feet and reach about five feet below the surface. In these forests the ant-eaters seemed to prefer the higher-lying, sloping sites for their permanent homes, evidently a safeguard against being drowned in a country with such a heavy rainfall. The heap of excavated soil near the open entrance seldom offers a clue to the real size of the irregular, winding burrow, as the weather rapidly effaces the traces of diggings carried on from time to time. Pygmy boys, with one end of a strand of rattan fastened to the waist and the other held by friends waiting outside, entered the burrows without hesitation and stated that there is a more spacious resting place at the very end of the tunnel shared often by an adult pair and their young. These boys, armed with only a knife, merely fastened the rattan around the live pangolin, which they prodded from behind while their companions pulled it slowly out of the hole. These otherwise harmless beasts, when touched while rolled up, suddenly switch their tail sidewise with such force that, if one's hand is caught between the rough body scales and the tail, it is seriously mutilated by the shearing action. Natives of the Ituri and Uele districts claim that the giant pangolins stay for weeks at a time in their burrows, but it is certain that at times they leave them several nights in succession to feed. One trailed to its underground home after a heavy rain was caught in nooses eighteen days later when trying to escape.

"One might think that animals so large and muscular would need great quantities of food, but this is only relatively true, for their sluggish habits considerably reduce the demands for nourishment. An adult male from Niapu measured 1530 mm. from snout to tip of tail, the latter accounting for 690 mm. The capacity of their stomach is relatively small, hardly more than two quarts (about two liters). In an adult female the stomach measured antero-posteriorly only 170 mm. and dorso-ventrally 70 mm. Büttikofer's remark, cited by Dr. Bequaert (p. 319), about a stomach of *M. gigantea* containing six liters of ants is evidently due to a slip of the pen. Ants and other food arrive intact in the stomach of the pangolin, but soon afterwards appear well disintegrated.

"In general outline and arrangement, the stomach of these giant anteaters is similar to that of *M. javanica* which is so well described by Weber (cited p. 318), though without the horny, tooth-like structures in the pyloric part. Nor does the large gland situated near the middle of the great curvature terminate in a common orifice but it presents an even surface, the individual follicles of the oval patch secreting directly into the stomach. In the absence of teeth, the stomach, with its highly specialized grinding mechanism, has become an organ replacing mastication. Half a handful of pebbles, the largest not exceeding five millimeters, usually found in the cardiac section, and the wall-muscles assist the trituration of food. These, and especially the more heavily muscled and distinct pyloric section, remind one of the gizzard of gallinaceous birds. The larger of the little stones are probably selected for this very purpose and are not incidentally introduced with the food as may happen with fine grit and other débris.

"The stomach is divided into two distinct parts, a larger cardiac and a smaller pyloric section. Both have somewhat the function of a gizzard. The cardiac section is lined with pavement epithelium and irregularly folded except for the large, well-defined gland patch. Here the processes of assimilation are greatly advanced. The food, mixed with the excretion of the glands, is easily ground to pieces between the pebbles and fine grit; usually only the hard, chitinous covering of the head and the strong mandibles of the ants escape being crushed in this section. The milling process is carried much further between the powerful muscles of the pyloric section, which is well set off from the other. This portion is lined with an epithelium similar to that in the cardiac section. Near and along the pyloric orifice there is, however, a well-defined smooth glandular area. The semicircular muscular mass, opposed on either side by, or rather fitted between, two other strong muscular pads is important. With the assistance ot fine grit, this arrangement works much like a mill and the food before reaching the pylorus is transformed into a finely ground mass from which nourishment can easily be assimilated. The intestine is without cæcum and rather long, measuring in an adult female 10.8 meters. A large amount of the blackish, hard excrement consists of the glossy particles of chitin of ants.

"The stomachs of *M. tetradactyla* and *M. tricuspis*, as shown long ago for the latter by Klinckowström,[1] are also divided into two parts. The cardiac section is lined with horny pavement epithelium, the mucous membrane showing folds with numerous, wavy crossbars. The pyloric section, with its soft, gland-bearing mucous membrane, is sharply set apart. Though the distribution of various glands differs in the two species, the muscular portion of the pyloric section in both is much like that of *M. gigantea*. A mass of fine grit also helps pulverize the ants during the extended milling process.

"The numerous forms of the aardvark, *Orycteropus afer* (Pallas) (Pl. XXIV, fig. 1), are distributed over most of the Ethiopian Region and are equally common in the Savannah and Western Forest Provinces. Their food consists of white ants (termites), and true ants are only incidentally taken, as they often inhabit termitaria. In external characteristics the aardvark resembles a pig, about six and one-half feet in total length, with a slender head, long ears, and a heavy, tapering tail about two and one-third feet long. Its very muscular limbs with their enormous claws denote fossorial abilities. The mouth is small, the snout slightly protruding and rather easily moved. The nostrils can be opened and shut at will and the edges are set with a dense border of short, stiff bristles turned outward in such fashion as to prevent insects from entering the nose. The long, extensile tongue is of relatively normal shape and the rather flat-crowned, peculiar cheek-teeth are capable of crushing food. The stomach lacks the highly specialized triturating organs of the Manidæ, though strong, muscular walls are present in the pyloric section. The absence of stone and grit also indicates that the gastric juices play the most important rôle in the disintegration and digestion of food and are sufficient to assimilate the soft-bodied termites but not the well-chitinized ants. Numerous parasitic worms are thus enabled to live in the stomach.

"Of the many aardvark burrows seen near Faradje, those with one entrance were scarcer than those with two, but three and even as many as eight openings to a single retreat were recorded. In one case the three entrances to a burrow were as much as fifty feet apart. Many of the tunnels, which reached about five feet below the surface, were deserted; those inhabited seemed to indicate that the aardvarks occupy them at intervals and occasionally dig holes merely for shelter. At times these inoffensive animals are driven out of their lodgings by warthogs and pythons, the latter being known to feed upon their young and to estivate in their burrows as well as in the cavities of termite hills.

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[1] 1895, Zool. Jahrb. Abt. Anat. Ontog., VIII, p. 495.

"The extensive tunnels of the burrows are large enough to admit a small man, who, among the Logo at Faradje, is armed with a short spear but trusts far more to his talismans for protection. The beast usually tries to save itself by digging, throwing the excavated earth into the face of its pursuer. Should the aardvark succeed in walling itself off, the undertaking is generally given up. If, however, the native is able to kill it, he indicates his position to an eagerly listening friend by tapping against the upper wall of the burrow. As rapidly as possible a shaft is sunk in his direction and the valiant hunter and the aardvark are lifted out. The meat is highly prized and in many regions the body has to be presented to the chief before any of the parts containing powerful medicines are removed.

"One of the African mongooses, *Bdeogale nigripes* Pucheran (Pl. XXV, fig. 3), not only satisfies its regular carnivorous instincts but, as stomach contents proved, feeds also on ants and termites. This mongoose attains the size of an otter, which it resembles in general appearance. It has large, dagger-like canines and an otherwise strong dentition; the palate is relatively wide and, especially in the young, has the general shape of that of the termite-feeding *Proteles cristatus* Sparrman.

"Of nine specimens collected, the stomach of one contained termites and those of three, driver ants which filled two of them to capacity; their possible incidental introduction with other food need, therefore, not be considered. The ants in the stomach were only slightly chewed and some of them were completely intact. This carnivore seems to have no adaptations that would allow it to devour with impunity an insect so dreaded by most other animals. It may be that these driver ants are swallowed dead, since they are often killed in masses when their droves are unexpectedly exposed to the deadly effect of the direct rays of the sun, as it may happen after a shower, when they are still on the march or feeding in great numbers on carrion.

"Among other mammals, some of the insectivores, especially certain Macroscelididæ (*Rhynchocyon*, *Elephantulus*, and *Macroscelides*), are credited with occasionally feeding on ants, probably those emerging from the ground in masses during their nuptial flights and which are easily taken.

"Chimpanzees (*Pan schweinfurthii* Giglioli) are well known to be omnivorous and, in addition to their regular vegetarian diet, feed on many insects and their larvæ. Nevertheless, I was surprised to see to what trouble they would go merely to relish half a handful of cocoons that a nest of robber ants (*Megaponera fœtens*) might contain, leaving untouched all the dead ants they might kill in the process. These primates are evidently not deterred in their raids by the painful sting and strong, pinching mandibles of the ants. They seldom pass one of the rather inconspicuous, temporary ant nests, which are marked only by a small heap of excavated particles of earth near the open entrance, without digging it out. After uprooting the plants they sometimes scoop out a hole one or two feet deep. In the Rain Forest near Niapu, I saw about seven nests of these robber ants destroyed in this manner.

"Colonies of certain large *Camponotus* are also looted by the chimpanzees, which, in this case, are fond of the ants themselves. Hollow or decayed trees are torn apart and the galleries searched for these ants, which, when attacked, do not swarm out but retreat speedily into the deeper recesses they excavate. In the forest about Niapu and on the road to Medje there were several such instances. In one case a troop of five or six of these anthropomorphs must have spent considerable time in trying to tear open a hollow portion of a log."

Man

Certain species of ants constitute an important article of food with many uncivilized peoples, especially of the warmer parts of the globe.[1] In tropical Africa the large, winged queens of *Carebara vidua* F. Smith, which at certain seasons emerge in great numbers from termite mounds, are often highly prized as delicacies; they are eagerly gathered for their swollen gaster, which is eaten raw or roasted.[2] In Kanara and other parts of India, and throughout Burma and Siam, a paste of the green weaver ant, *Œcophylla smaragdina* (Fabricius), is eaten as a condiment with curry.[3] Beccari[4] also records that the Dyaks of Borneo "eat this ant, or rather they mix it with their rice as a condiment; it has a pungent acetic taste and smell which they evidently like." The same ant is used by the natives of North Queensland mashed up in water, like lemon squash, and forms the basis of a pleasant acid drink appreciated even by many European palates.[1]

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[1] Provancher (1882, Natural. Canadien, XIII, pp. 30-31) mentions that the Canadian lumberjacks sometimes eat carpenter ants (*Camponotus pennsylvanicus*). See also Riley, C. V., 1893, 'The edible quality of ants,' Insect Life, V, p. 268.

[2] Bequaert, J., 1913, Rev. Zool. Afr., II, pt. 3, p. 429. Mr. Lang, who observed the nuptial flight of *Carebara vidua* at Stanleyville in March 1915, also notes that these ants are comestible; "only the abdomen is eaten by the natives, sometimes raw, sometimes fried, also crushed."

[3] Bingham, C. T., 1903, 'Fauna of British India. Hymenoptera,' (London), II, p. 311.

"The Murries of Bastar—the southernmost Native State in the Central Provinces—use the red ants (*Œcophylla smaragdina*) as a regular article of diet. Throughout the year, but more especially during the dry season, the Parjas—a sub-class of the Murries—collect nests of the red ants, and after tearing them open, shake out the contents into a cloth, and beat the insects—mature and immature—into a pulpy mass with a stone, and when all are dead, enclose them in a packet, about the size of a goose's egg made of sal leaves. In this condition the article is taken to the bazaar and sold, about 16 being sold for a pice, or 4 cowries each. To prepare the squashed ants for food, they are mixed with salt, turmeric and chillies, and ground down between stones, and are then eaten raw with boiled rice. They are sometimes cooked up with rice flour, salt, chillies, etc., into a thick paste, and in this condition the food is said to give the eater of it great power of resistance against fatigue and the sun's heat" (Long, A. M., 1901, 'Red ants as an article of food,' Journ. Bombay Nat. Hist. Soc., XIII, No. 3, p. 536).

[4] Beccari, O., 1904, 'Wanderings in the great forests of Borneo,' (London), p. 161 (1902, 'Nelle foreste di Borneo,' (Florence), p. 237).

Moreover, it is generally known that certain American Indians eat ants, as well as other insects, freely. This is especially true of the tribes that are but little inclined toward agriculture, periods of famine with them being rather frequent, due to the absence of permanent vegetable staples.[2] In his delightful book, 'My first summer in the Sierra,' John Muir[3] tells how the Digger Indians of California are fond of the larvæ and even of the adults of the large jet-black, wood-boring ants (*Camponotus*), of which "they bite off and reject the head, and eat the tickly acid body with keen relish." In his account of the honey ants of North America, McCook[4] remarks that the uses to which the Mexicans and the Indians of the southwestern United States put the replete of *Myrmecocystus* are various. "That they eat it freely, and regard it as a delicate morsel is beyond doubt. Prof. Cope, when in New Mexico, had the ants offered to him upon a dish as a dainty relish. The Mexicans (Lœw) press the insects, and use the gathered honey at their meals. They also are said to prepare from it by fermentation an alcoholic liquor. Again they are said (Edwards) to apply the honey to bruised and swollen limbs, ascribing to it great healing properties."

One finds in the narratives of Barrère,[5] de Azara,[6] Humboldt,[7] Rengger,[8] Richard Schomburgk,[9] and other travelers[10] frequent allusions to the fondness of many South American tribes for the large males and queens of the common leaf-cutters, *Atta cephalotes* (Linnæus) and *A. sexdens* (Linnæus). Schomburgk vividly describes how these ants are collected by the Indians of British Guiana, when, with the first rainstorms, large numbers of the winged, sexual forms leave their mound-shaped nests. Their heads are pulled off as soon as they are caught, and the swollen gaster, filled with fatty tissue, is roasted or otherwise cooked; "thus prepared, these insects are considered even daintier than the larva of *Calandra palmarum*."

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[1] Saville Kent, W., 1897. 'The naturalist in Australia,' (London), p. 253

[2] See Skinner, A., 1910. 'The use of insects and other invertebrates as food by the North American Indians.' Journ. New York Ent. Soc., XVIII, pp. 264–267.

[3] Muir, J., 1916, 'My first summer in the Sierra,' (Boston and New York), p. 46.

[4] McCook, H. C., 1882. 'The honey ants of the Garden of the Gods and the Occident ants of the American plains.' (Philadelphia), p. 32.

[5] Barrère, P., 1741. 'Essai sur l'histoire naturelle de la France Équinoxiale,' (Paris), p. 198. Speaking of an ant of British Guiana which he calls *Formica major, volans, edulis*, this traveller writes: "Cette fourmi est passagère et paraît en grand nombre au commencement des pluies. Les nègres et les créoles mangent le derrière de cet insecte, qui est une sorte de petit sac, de la grosseur à peu près d'un pois chiche, rempli d'une liqueur blanchâtre, miellée, qui ne paraît être autre chose que les œufs qu'il dépose dans ce temps-là."

[6] de Azara, F., 1809, 'Voyages dans l'Amérique Méridionale,' (Paris), p. 199: "Les habitants de la ville de Santa Fé, qui est de ces côtés-là, vont à la chasse de ces fourmis ailées: on en prend la partie postérieure, qui est fort grasse, on la fait frire, et on la mange en omelette; ou bien après les avoir fait frire, on les passe au sirop et on les mange comme des dragées." After quoting this passage, Gallardo (1916, An. Mus. Nac. Buenos Aires, XXVIII, p. 344) adds that the gaster of the females of *Atta sexdens* (Linnaeus), called *tanajura*, is still eaten by the Brazilians.

[7] Humboldt, Al. de, 1822, 'Voyage aux régions équinoxiales du Nouveau Continent, fait par A. de Humboldt et A. Bonpland,' (Paris), VII, pp. 443–444.

[8] Rengger, A., 1835, 'Reise nach Paraguay in den Jahren 1818 bis 1826 von Dr. J. R. Rengger,' (Aarau), p. 253.

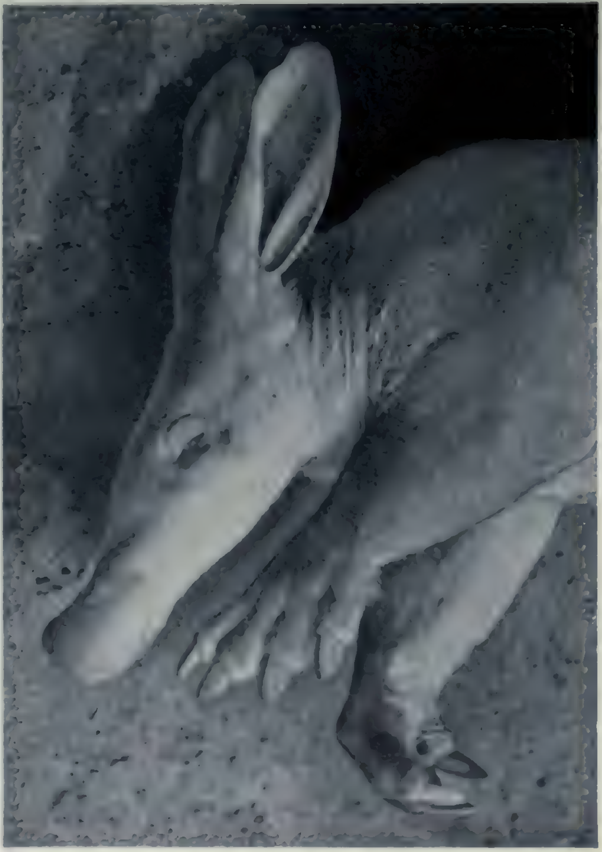
[9] Schomburgk, Rich., 1848, 'Reisen in British Guiana,' (Leipzig), II, p. 112.

[10] See Orton, J., 1876, 'The Andes and the Amazon,' 3d Ed., (New York), p. 301; Spruce, Rich., 1908, 'Notes of a botanist on the Amazon and Andes,' (London), I, p. 484.

Plate XXIV

Fig. 1. *Orycteropus afer* (Pallas). Freshly killed female, at Faradje, March 6, 1911. Anterior portion of the body, showing the elongated snout and the heavily built fore limbs with their powerful digging claws.

Fig. 2. *Manis gigantea* Illiger. Freshly killed female, at Niangara, April 26, 1913. Anterior view, showing the elongate snout and lengthened, heavy claws of the fore limbs.



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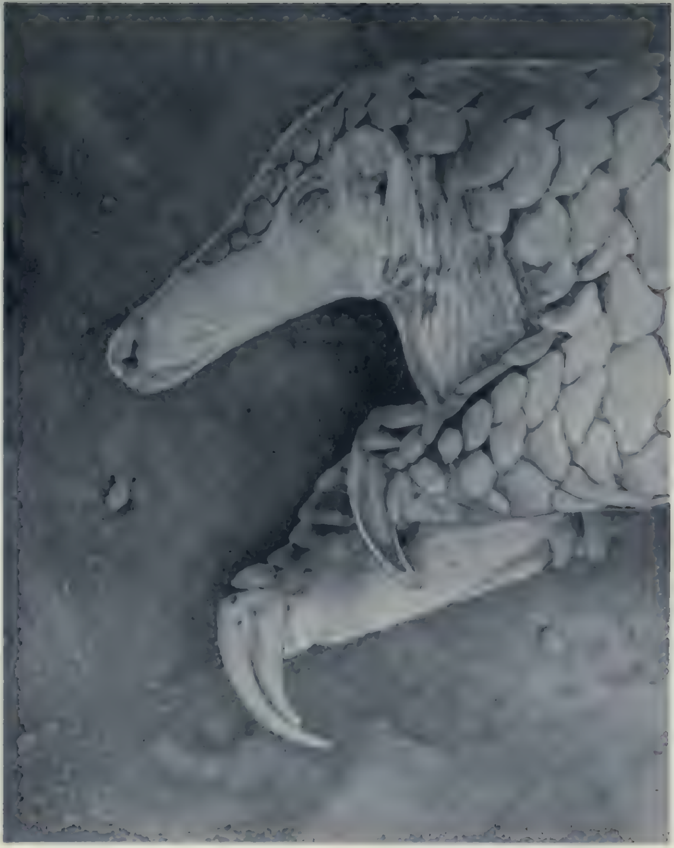

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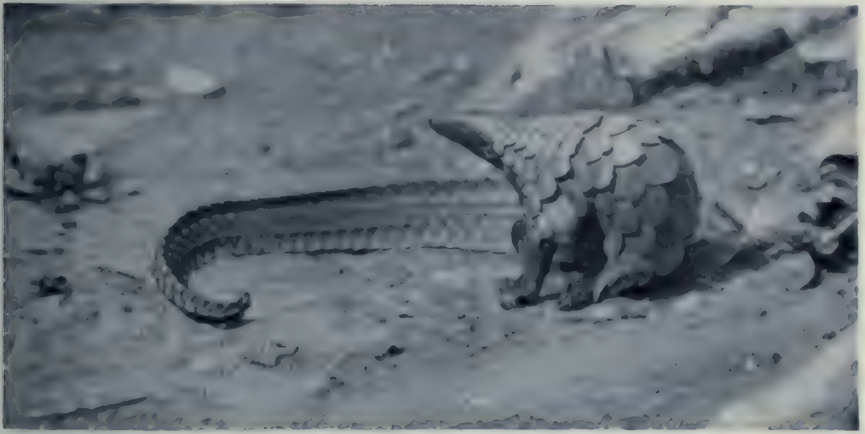
PLATE XXV

Fig. 1. *Manis tetradactyla* Linnæus. Living male, at Niapu, December 16, 1913. An arboreal species.

Fig. 2. *Manis gigantea* Illiger. Live young female, at Poko, August, 1913. Typical pose of the animal while in search of its food.

Fig. 3. *Bdeogale nigripes* Pucheran. Freshly killed male, at Akenge, October 8, 1913.



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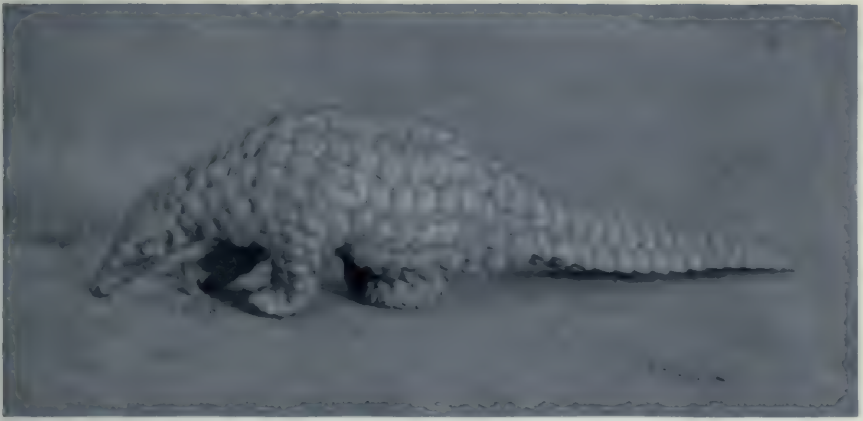

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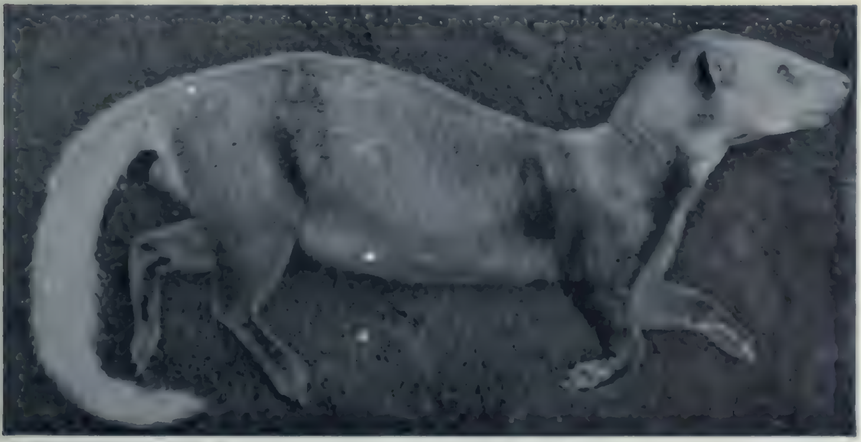

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IV.—ANTS IN THEIR DIVERSE RELATIONS TO THE PLANT WORLD

By J. Bequaert

The following contribution is an attempt to summarize what is known at present of the widely varied and often intricate relations which exist in nature between ants and vegetation. It has primarily grown out of an examination of certain so-called "myrmecophytes," or ant-plants, which I frequently came across during my travels in the Belgian Congo in quest of zoological and botanical specimens. Prof. Wheeler's study of the feeding habits of the larvæ of certain plant-inhabiting ants collected by Messrs. H. Lang and J. P. Chapin and myself in the Congo, and Prof. I. W. Bailey's investigation of the anatomy of myrmecophytes show that the whole subject of the mutual adaptations of plants and ants is in need of a thorough revision. It thus seemed appropriate that the present opportunity be used to bring together the many isolated and scattered observations which have been made on the interrelations of these organisms. Indeed, the problem of myrmecophytism is dominated by the feeding habits of the ants and their young and, until these are perfectly understood, we can scarcely hope to grasp the true ecological meaning and the probable origin of the extreme cases of apparent or true symbiosis between certain ants and certain species of plants. It is, therefore, of the utmost importance to inquire carefully into the various ways in which ants are wont to benefit by the vegetation.

Although much time has been spent in consulting botanical and entomological papers for information bearing on the subject, undoubtedly a number of interesting observations have escaped my notice. In keeping with the general purpose of the present contribution to African Myrmecology, especial attention has been paid to work accomplished in the tropics, primarily in Africa. The bibliography appended to this part is as complete as possible. In it are included many papers which may seem to have but remote connection with the subject—such as, for instance, those on fungus-growing termites, intracellular symbionts, and the like. I believe, however, that they are indispensable in reference to the study of certain activities of ants. Some students may find the botanical side rather too fully treated, but this seemed unavoidable in providing the necessary background for future field work, especially to the myrmecologist. Moreover, I am convinced that the ultimate solution of many of the problems involved can only come from a close coöperation between botanical and entomological experts, and this, under present conditions of specialized training, is not so easily realized.

Many of the data here presented were brought together during the several weeks I had the pleasure of spending at the Bussey Institution for Applied Biology of Harvard University. I wish to thank President Henry Fairfield Osborn and the authorities of The American Museum of Natural History for the liberal manner in which I have been able to carry on this work. I am also under great obligations to Professors Wm. M. Wheeler and I. W. Bailey, of Harvard University, for their many suggestions and criticisms during my stay at the Bussey Institution. The interest they have shown in the work has been a steady encouragement and their advice invaluable.

1. VARIOUS RELATIONS BETWEEN ANTS AND VEGETATION

Economic Importance of Ants

The question whether ants are, broadly speaking, noxious or beneficial insects is still debated by agriculturists and economic entomologists.

> While it is believed on the one hand that ants attack and mine only sick and decaying plants, especially decaying roots, on the other hand it is claimed that healthy plants, which show no trace of disease, are also assailed by ants. In any case further exact observations concerning the relation of ants with plants will be needed in order to clear up this problem. The elucidation of the question of the direct noxiousness of ants to plants is the more desirable, since we possess in the ants partly a welcome help against other animal enemies of culture-plants, which they pursue and destroy. It is therefore necessary that we learn more in detail whether their harmfulness outweighs their utility or vice versa. In general one can perhaps say that, judging from statements which have been made thus far, their noxiousness to plants, by attacking roots, stems or branches, is not very great. (G. Aulmann and W. La Baume, 1912, p. 61.)

In their recent study on the feeding habits of ants, Wheeler and Bailey (1920, p. 236) have pointed out that one reason why the economic importance of many common ants remains so dubious or ambiguous is the lack of precise information with regard to the quality and quantity of their food, especially in the larval stage. These authors have shown, for instance, that ants carry on their bodies and in the food-pellets of their infrabuccal pockets an extraordinary number and variety of fungus spores and bacteria. It is, therefore, quite possible that these insects have a great but hitherto only vaguely apprehended importance as carriers of the germs of certain plant, animal and human diseases. That ants are active carriers of pathogenic micro-organisms has been further suggested by Darling (1913), Wheeler (1914), Studhalter and Ruggles (1915), Grabham (1918), and Bailey (1920).

The leaf-cutting ants of the tribe Attini, so abundant in tropical and subtropical America, are decidedly destructive to the vegetation and are rightly considered one of the worst pests to South American agriculture. Accounts of their depredations are found in practically all narratives of South American travellers. Though they attack many of the native herbs, shrubs, and trees, they often show a predilection for cultivated plants. It is no uncommon thing to find the saúvas, *Atta cephalotes* (Linnæus), so numerous in certain spots that the planters are forced to abandon their fields. Speaking of the ants in the Brazilian coffee districts, Van Delden (1885, pp. 297–298) writes: "The enemy most dreaded in the fazendas (plantations) is indubitably the saúva, or tana-jura, a dark-brown ant, two centimeters long, which undermines the ground by digging extensive passages and dens in all directions. It attacks all sorts of trees, the coffee-shrub among others, but has a decided preference for the orange and citron trees in the coffee gardens." H. W. Bates (1863) and others have noted that these ants often become troublesome to the inhabitants because of their habit of plundering the stores of provisions in houses at night.

The Attini are not represented in the Old World tropics, but possibly ants of other groups have developed similar habits there, though on a smaller scale. G. Aulmann (1912, p. 156) and Moorstatt (1914) mention that a leaf-cutting ant was observed in German East Africa at times causing considerable damage to cotton plants. The specific identity of this ant has not been ascertained, but it probably belonged to the genus *Messor*, which is known to collect pieces of grass in addition to seeds and grain (see Sjöstedt's observation quoted below, p. 359). King (1911) also notes that *Messor barbarus* (Linnæus), at Khartum, damages garden plants by biting off and carrying away the leaves, and adds that in cotton fields the sites of their nests are marked by bare patches devoid of vegetation. What use these ants make of the vegetable matter thus carried into their nests has not been investigated.

There are a few other cases on record of ants directly destroying living parts of plants. It is generally known that certain ants will injure buds and fruit in order to feed on the exuding sap (see Müller-Thurgau, 1892, pp. 134–135). Forel (1885, p. 338) mentions instances of *Tetramorium cæspitum* (Linnæus) attacking young roots of healthy sugar-beets at Vaux, Switzerland, many of the plants dying from the injuries received. J. Pérez (1906, pp. xxxii–xxxiv) records the havoc played by the same ant on the tubers of potato, near Bordeaux, more or less deep cavities being excavated and many young plants killed; *T. cæspitum* was also found burrowing superficial galleries in the stems of living potato plants and attacking the roots of young cabbage and carrot.[1] In North America, *Solenopsis geminata* (Fabricius) and *S. molesta* (Say) often do injury to the soft parts of planted seeds, and the former also to strawberries (Webster, 1890) and other fruit. *S. molesta* has proved very injurious in gardens and fields; the chief damage is done to seeds of sorghum and corn, which are hollowed out undoubtedly for the purpose of extracting the oils (McColloch and Hayes, 1916; Hayes, 1920). According to Green (1900*a*) and G. R. Dutt (1912, p. 247), the Indian *Dorylus orientalis* Westwood is mainly or exclusively herbivorous, feeding on the bark of trees and the healthy tubers of plants, a habit the more remarkable since the majority ot Dorylinæ are highly carnivorous. In Cameroon, certain ants have been seen attacking the fruits of cacao-trees: *Camponotus maculatus* subspecies *brutus* (Forel) gnaws the base of fruit-stalks where they are inserted into the trunk, licking up the sap at the wound, causing the fruits to drop off or dry; *Crematogaster africana* variety *winkleri* (Forel) gnaws away the skin of the cacao-fruit, often almost completely; while *Camponotus acvapimensis* Mayr and *Œcophylla longinoda* (Latreille) are accused of the same evil, though they cause but little damage (H. Winkler, 1905, pp. 129–137).

The greatest harm to the vegetation is undoubtedly done indirectly, both in tropical and temperate regions, by a host of species of ants that have a pronounced fondness for pasturing and guarding plant lice, scale insects, tree-hoppers, and other plant bugs on roots, stems, and foliage; all these Hemiptera suck the juices of plants, and their protection by the ants must, therefore, be regarded as pernicious. The "milking" habit among ants seems to be of very frequent occurrence, evidently because it offers so many advantages over direct feeding on plant-juices. Not only is the food supply much more abundant at any one time and within easier reach, but, in addition, the plant saps undergo chemical changes in the digestive tract of the Hemiptera, whose anal secretion, on which the ants feed, therefore contains a great amount of invert-sugar, instead of the much diluted cane-sugar of the plant. Many of the aphids attended by ants have undergone adaptive modifications of structure and behavior which show that their relations with ants have become of a mutualistic nature, and it is probable that the same will be found true for some of the ant-attended coccids and membracids of the tropics.

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[1] This habit of *Tetramorium cæspitum* in attacking subterranean parts of plants was known to Linnæus, since he adds to the original description of this ant ('Syst. Nat.,' Ed. 10, 1, 1758, p. 581): "Habitat in Europæ tuberibus." It is rather surprising that injuries by this ant have been so little noticed in later times. Concerning ants noxious in gardens, see also F. Heim (1894), Andersson (1901), and Cooley (1903).

Indeed, the association between phytophagous Hemiptera and ants offers a typical illustration of symbiosis in the strict sense, advantageous to both parties. The benefit that accrues to the ants has been explained above and needs no further comment; that derived by the Hemiptera, however, is of a more complex nature. It is obvious that the ants protect the plant bugs by driving away coccinellid beetles, ichneumon flies, and other enemies. In the case of aphids and coccids the ants frequently build tents or cowsheds over these insects, which thus continue to suck the juices of the plant while being "milked" by the ants and are, at the same time, protected from their enemies, from alien ants, and intemperies, and prevented from escaping to other plants.

The tent-building habit was discovered by P. Huber (1810, pp. 198-201) for *Lasius niger* (Linnæus) in Europe, and Forel (1874, pp. 204-205 and 420-422) gives an interesting account of it in his classical 'Ants of Switzerland.' *Lasius niger* has similar habits in North America (Wheeler, 1911*b*) and Japan (Stopes and Hewitt, 1909, pp. 1-6). This ant builds its tents of detritus or wood-fibres; while, according to Forel, certain species of *Myrmica* enclose their aphids in earthen cells, which communicate with the ground nest by means of covered galleries. Wheeler (*loc. cit.*) has described in detail the tent-building of the North American *Crematogaster lineolata* (Say) and I have found that several African members of this genus which attend coccids have similar habits. Certain North American species of *Lasius* (*L. flavus*, *L. niger*, and the species of the subgenus *Acanthomyops*) which live to a very large extent or exclusively on the excrement ot root-aphids and coccids, remain throughout the year the constant companions of the lice, even hoarding in their nests during winter the eggs or the wingless, agamic form of the aphids and the fertile females of the scale insects. Forbes (1896), Webster (1907), and others have shown that the common North American *Lasius niger* variety *americanus* Emery guards the eggs of the corn root aphid (*Aphis maidi-radicis* Forbes) throughout the winter, shifting them about, as it does its own young, to accommodate them to changes of weather and moisture. In spring, the young lice, on hatching from these eggs, are conveyed by the ants during fair weather to the roots of various weeds, being taken back to the burrows in bad weather or on cold nights. After the corn plants have started to grow, the young root lice, all of which belong to the wingless, agamic form, are transferred from the weeds to the roots of young corn, where they are tended throughout the spring and summer. It would thus appear that, without the aid of the little brown ant, this aphid is unable to reach the corn plants.

Still more surprising is Lubbock's observation that *Lasius flavus* cares in a similar manner for the eggs of certain aphids on the aërial portions of plants.

> The eggs are laid early in October on the food-plant of the insect. They are of no direct use to the ants, yet they are not left where they are laid, where they would be exposed to the severity of the weather and to innumerable dangers, but brought into their nests by the ants, and tended by them with the utmost care through the long winter months until the following March, when the young ones are brought out and again placed on the young shoots of the daisy. This seems to me a most remarkable case of prudence. Our ants may not perhaps lay up food for the winter, but they do more, for they keep during six months the eggs which will enable them to procure food during the following summer. (Lubbock, 1880, p. 184.)

In temperate regions the honeydew (or sugary excrement) secreted by aphids from the posterior end of the alimentary canal is eagerly sought for by many of the common Myrmicinæ, Dolichoderinæ, and Formicinæ,[1] those attending root lice being especially harmful to the vegetation for the reasons mentioned above.[2] Certain tropical ants also nurse root-aphids. In Java, *Acropyga acutiventris* Roger may thus become a serious pest to coffee plantations, and, according to Forel, various species of *Rhizomyrma* attend root lice in South America and New Guinea (K. Escherich, 1911*b*, p. 227, footnote). In the tropics, however, aphids are far less common than in colder climes and are there replaced as ant "cows" by various Coccidæ, Membracidæ, Fulgoridæ, Cicadellidæ (Jassidæ), and Psyllidæ, certain members of these families being occasionally attended by ants even in North America and Europe.

The relations between various species of tree-hoppers and certain ants have been recently reviewed by Funkhouser in his 'Biology of the Membracidæ of the Cayuga Lake Basin' (1917, pp. 399–404), to which the student is referred for further details. Funkhouser comments on the number of unsolved problems in connection with this subject.

> One of the first of these questions is suggested by the fact that some of the species are attended by ants while others are unattended although there are apparently no physiological or anatomical differences to cause the distinction. Another question arises from the fact that certain species attended locally have never been reported as being attended in other parts of the country, while on the other hand some of the species that are never attended in this basin are always attended in other localities. Again, certain species that the ants ignore in this basin are represented by closely related species in other regions and these exotic forms—often of the same genus and very near systematically—are well attended.

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[1] It would appear that these trophobiotic habits are of great antiquity among ants, dating as far back as the Tertiary. Wheeler (1914, p. 21) found a block of Baltic amber containing a number of workers of *Iridomyrmex göpperti* (Mayr) together with a lot of their aphid wards.

[2] See the publications of S. A. Forbes on the corn root aphid, listed in the bibliography; also Garman's (1895) account of the bean root louse.

He also notes that certain common species which, in the nymphs at least, appear to exude the characteristic anal fluid when disturbed, nevertheless are not attractive to ants. He found the following species of Membracidæ attended by ants in the vicinity of Ithaca, New York: *Thelia bimaculata* (Fabricius), *Telamona ampelopsidis* (Harris), *T. unicolor* Fitch, *Cyrtolobus vau* (Say), *Atymna castaneæ* (Fitch), *Ophiderma pubescens* (Emmons), *Vanduzea arquata* (Say), *Entylia bactriana* Germar, and *Publilia concava* (Say).

The following ants were actually observed by Funkhouser taking the secretion from the membracids: *Formica truncicola* subspecies *obscuriventris* (Mayr), *Formica exsectoides* Forel, *Camponotus pennsylvanicus* (DeGeer), *Crematogaster lineolata* (Say), and *Prenolepis imparis* (Say). All these ants seemed to make no distinction between the various species of tree-hoppers listed above and the mutual behavior of these insects was much the same in all the cases studied: "The ants stroke their charges with their antennæ, whereupon the membracids give off from the anal tube a liquid that issues in bubbles in considerable quantity. The anal tube of the membracid is capable of great evagination especially in the nymphs, in which it is long and cylindrical and usually tipped with a fringe of fine hairs. The honeydew is eagerly taken from the end of this tube by the ants. In many species the adults as well as the nymphs are sought, and the ants seem to be as attentive to one as to the other but the adults have not been observed to excrete the liquid to the same extent as the nymphs." (Funkhouser, 1917, p. 403.) The liquid sought by the ants "is colorless and transparent, rather heavy and somewhat sticky. When first exuded it is inclined to be frothy, due no doubt to bubbles of air which emerge with it, but it quickly clears on settling. It is practically tasteless even in comparatively large quantities, and many attempts to distinguish a sweet taste have proved unsuccessful. The term *honeydew*, therefore, commonly applied to the fluid, is hardly a descriptive one. It is very likely, of course, that the liquid may contain sugars not detected by the human tongue, and this would seem to be indicated by the fact that fermentation appears to begin if the substance is left exposed. No chemical analysis of honeydew has been made." (*Op. cit.*, p. 404.)

Miss Branch (1913, pp. 84–85) states that young *Entylia sinuata* seemed unable to molt successfully without the presence of ants. This fact led her to believe that the ants are necessary factors in the life of an individual membracid. Funkhouser's experiments, however, gave no support to this theory. Tree-hoppers of many species were reared in the field and in the insectary, with and without ants, and no difference was noted in the length of the instars or success of the molting process.

Kornhauser (1919, p. 546) gives the following account of the manner in which *Thelia bimaculata* (Fabricius) is attended by ants. This membracid feeds on the sap of the common North American locust tree, *Robinia Pseudo-acacia* Linnæus. It deposits its eggs in slits in the bark, where they remain during the winter, hatching in early June. The first, second, and third instars occur on the branches, constantly attended by ants:

> In my principal collecting fields [at Cold Spring Harbor, New York], *Formica truncicola* Nylander subspecies *obscuriventris* and *Cremastogaster lineolata* Say were the chief ants associated with *Thelia*. When tapped by the antennæ of the ants, the *Thelia* nymph or adult exudes from the anal tube a drop of clear fluid which is taken by the ant with great alacrity. Toward the middle of June, the ants build collars about the bases of the locust trees, and inside these collars in the cracks of the bark are to be found hundreds of *Thelia* nymphs of third to fifth instar, quietly feeding and undisturbed by the numerous ants in attendance. In this moist situation, protected from many of their enemies, the nymphs thrive. *Formica* builds the protecting collar of leaves, twigs, and bits of wood; *Cremastogaster* builds of sand grains cemented together. When one breaks the collar, many ants swarm out and attack the intruder, *Formica* biting one's fingers ferociously, while others grab the *Thelias* and drag them into underground passages. These pugnacious ants seem to have complete mastery of the *Thelia* nymphs.

Membracidæ are sometimes carried by ants into their formicaries (Enslin, 1911, pp. 19–21; W. M. Mann, 1915, p. 162), but they usually die soon, probably due to lack of food.[1]

Lamborn (1914) has described in detail several cases of trophobiosis between ants and coccids, membracids, jassids, and psyllids in Southern Nigeria. Regarding *Leptocentrus altifrons* Walker, a tree-hopper which is invariably ant-attended in its mature and larval stages, he writes as follows: "The solicitude of ants for the larvæ has a very definite object, for they are extremely partial to the fluid excreted at the anal extremity, and I remember seeing a *Camponotus akwapimensis* variety *poultoni* with the caudal whip of a membracid larva actually in its mouth." (Lamborn, 1914, p. 495.) I have on several occasions, in the Belgian Congo, collected ants which were in the act of attending tree-hoppers: so, for instance, in April 1912, at Elisabethville, Katanga, a number of workers of the common *Pheidole megacephala* subspecies *punctulata* (Mayr) were busily engaged in licking the sweet excretions of some of these hemipterous insects feeding on a bush; again, at Welgelegen, Katanga, *Myrmicaria eumenoides* subspecies *opaciventris* variety *congolensis* (Forel) was found attending membracids fixed on the calyx of a malvaceous plant (Bequaert, 1913, pp. 427 and 428). Bell-Marley at Durban, Natal, observed that the common South African tree-hopper, *Oxyrhachis tarandus* (Fabricius), attracts great numbers of "small red ants." (Distant, 1908, p. 209.)

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[1] Additional information concerning the relations between Membracidæ and ants is given by Belt (1874), Mrs. Rice (1893), Green (1900*a*), Froggatt (1902, p. 717), Baer (1903), Buckton (1903, p. 262), Poulton (in Buckton, 1903), Distant (1908, p. 209), Enslin (1911), Miss Branch (1913), Kershaw (1913), Lamborn (1914), and others.

The nursing of scale insects by ants has repeatedly been noticed by Cockerell, Newstead, King, and others.[1] A rather interesting phase is offered in the case of various ants which keep coccids inside the swellings of myrmecophytes. Zimmermann found *Lecanium tenebricophilum* Green at Buitenzorg, Java, together with ants in living branches of *Erythrina lithosperma* Blume (Green, 1904, p. 204). In southern Europe, *Crematogaster scutellaris* (Olivier) and *Camponotus pubescens* (Mayr) often become harmful to olive trees by the care they bestow upon scale insects (Peragallo, 1882). Keuchenius (1914*a* and *b*) holds the view that *Œcophylla smaragdina* is very noxious to coffee plantations through its habit of keeping and protecting in its nests the green coffee scale, *Lecanium viride*, one of the most serious pests to the coffee tree. Gowdey (1917) also mentions that the root form of *Pseudococcus citri*, a parasite of coffee, orange, lemon, and cacao in Uganda, is attended by the ant *Pseudolasius gowdeyi* Wheeler.

Most of the wood-boring ants either accommodate themselves to pre-existent galleries made by other insects or attack dead wood only. Occasionally they find their way into houses. Forel (1874) and R. Brun (1913) have described cases in which populous colonies of the European *Camponotus ligniperdus* and *C. herculeanus* had excavated the beams, window-sills, and other wooden parts of buildings. Certain carpenter ants of temperate regions (*Camponotus ligniperdus*, *C. herculeanus*, *C. pubescens*, and others) extend their burrows into healthy wood (Forel, 1874); they may thus become very destructive in forests, the more so since they attract woodpeckers, which bore large access-holes through the perfectly healthy outside layers of the tree in order to feed on the carpenter ants and their brood. S. A. Graham (1918) describes how carpenter ants of an unidentified species are responsible for great damage to standing white cedar in Minnesota, at least twenty per cent of the trees cut showing ant injury to the stump. In this case, so far as observed, the ant never attacks a sound tree, but always gains entrance through a wound or decayed spot. When a colony has been established in a tree, the ants usually work well above the rotten area into the sound heartwood, honey-combing the tree with longitudinal galleries until there is often only a thin outer shell of solid wood. From the main nest they cut openings to the outside, frequently following a knot, through which the sawdust can be cast and through which the inhabitants may pass to and fro. Ants which make their galleries in the bark (such as many species of *Leptothorax*) usually do not burrow beyond the external dead layers and occasion little or no damage, except in cases where the bark itself is of economic value: *Camponotus herculeanus vagus* (Scopoli) and *Crematogaster scutellaris* (Olivier) are credited with destroying the bark of cork-oaks in southern Europe and North Africa (Maceira, 1904; Emery, 1908; Seurat, 1901; A. Krausse, 1913 and 1919).

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[1] In India the lac-producing coccid, or lac insect, *Tachardia lacca* (Kerr), is frequently attended by ants, *Cremastogaster subnuda* (Mayr) and *Camponotus compressus* (Fabricius), which may become a source of regular annoyance to the lac grower. In their eagerness to obtain "honeydew" the workers often nip off the white filaments, the two anterior of which are connected with the respiratory apparatus of the lac insect, the coccid being killed consequently (G. R. Dutt, 1912).

Harvesting ants have often been accused of depredations in cereal fields, but these charges are apparently much exaggerated. Emery (1891, pp. 176–177), it is true, has observed in Italy that species of *Messor* actively engage in carrying off grain during the harvest. It does not seem, however, that the damage thus done could be very serious, since harvester ants collect mainly seeds of weeds and wild grasses. Yet in certain regions of North Africa, where colonies of *Messor* are very numerous, the grain these ants store away may amount to an appreciable portion of the harvest. Ducellier (1912) estimates that, in Algeria, *Messor barbarus* collects 50 to 100 liters of wheat from each hectare. J. Pérez (1905, pp. xxxiv–xxxv) has recorded cases in which *Messor barbarus* stole freshly sown carrot-seeds and also the ripe seeds of coriander in a vegetable garden near Bordeaux. Similarly, Koningsberger (1908, p. 99), in Java, blames *Plagiolepis longipes* (Jerdon) with stealing planted seeds of tobacco.

A few species of ants are commonly found in houses, boats, and ships; they are spread by commerce to considerable distances, and rapidly become cosmopolitan.[1] Such domestic species in the Belgian Congo include, among others, *Monomorium pharaonis* (Linnæus), *Tetramorium simillimum* (F. Smith), and especially the many forms of *Pheidole megacephala* (Fabricius); the last-named is the famous house ant of Madeira (O. Heer, 1852 and 1856), which has now established itself everywhere in the tropics and subtropics.[1] In the Congo, the large workers of a form of *Camponotus maculatus* can also frequently be seen at night in houses in search of food. They are particularly fond of sweets, of which they may absorb considerable quantities, their gaster then becoming greatly distended. At Khartum, cases of œdema of the eyelids have been ascribed to the bites of ants (Chalmers, 1918). Yet even these domestic ants should not be considered wholly noxious, because many of them are to a large extent carnivorous, thus destroying great numbers of roaches, larvæ of flies, and other indoor pests (see Illingworth, 1913 and 1917). Perhaps the most dreaded of these house ants are the fire-ant, *Solenopsis geminata* (Fabricius), a very pugnacious species with a severe sting, and the Argentine ant, *Iridomyrmex humilis* Mayr, which is becoming a serious nuisance in many subtropical countries.[2]

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[1] Donisthorpe (1915, pp. 334–350) has given an interesting account of the exotic ants which have been introduced into Britain. His list includes fifty-one species, but only a small number of these have established themselves there; they are most commonly found in hothouses.

By far the majority of ants afford to the vegetation a very effective protection, destroying a large number of phytophagous insects.[3] Foremost in this respect are the driver ants (Ecitonini in America, Dorylini in the Old World tropics), with their populous colonies and wandering habits, and also the many, highly carnivorous Ponerinæ.[4]

The wandering armies of South American *Ecitons* have been described by H. W. Bates (1863, p. 354), Belt (1874, p. 17), and many others. Perhaps Richard Spruce's account (1908, II, pp. 370–373) gives the clearest idea of the usefulness of their operations and it is interesting enough to be quoted at length:

> Ecitons or foraging ants (called Cazadoras in Peru) seem to be true wandering hordes, without a settled habitation; for a certain number of them may always be seen carrying pupæ, apparently of their own species; but they sojourn sometimes for several days whenever they come upon suitable food and lodging. . . .
>
> The first time I saw a house invaded by Cazadoras was in November 1855, on the forest slope of Mount Campana, in the Eastern Peruvian Andes. I had taken up my abode in a solitary Indian hut, at a height of 3,000 feet, for the sake of devoting a month to the exploration of that interesting mountain. The walls of the hut were merely a single row of strips of palm trees, with spaces between them wide enough to admit larger animals than ants. One morning soon after sunrise the hut was suddenly filled with large blackish ants, which ran nimbly about and tried their teeth on everything. My charqui proved too tough for them; but they made short work of a bunch

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[1] *Pheidole megacephala* has of late been replaced as house ant in Madeira by the Argentine ant, *Iridomyrmex humilis*.

[2] Ants more commonly found in or near houses in India are, according to Assmuth (1907, p. 302), *Prenolepis longicornis* (Latreille) and *Monomorium pharaonis* (Linnæus).

[3] The activity of ants in destroying noxious insects was discussed in detail by H. Stitz (1917) in a recent paper. Delpino (1875, p. 89) expressed the view that "the ants are the chief equilibrating and moderating factors affecting phytophagous insects," perhaps a somewhat overdrawn statement.

[4] Some of the African Ponerinæ are almost exclusively termitophagous. See, for instance, the accounts of the habits of *Megaponera fœtens* (p. 65), *Paltothyreus tarsatus* (p. 62), and others.

> of ripe plantains, and rooted out cockroaches, spiders, and other suchlike denizens of a forest hut. So long as they were left unmolested, they avoided the human inhabitants; but when I attempted to brush them away they fell upon me by hundreds and bit and stung fiercely. I asked the Indian's wife if we had not better turn out awhile and leave them to their diversions. "Do they annoy you?" said she. "Why, you see it is impossible for one to work with the ants running over everything," replied I. Whereupon she filled a calabash with cold water, and going to the corner of the hut where the ants still continued to stream in, she devoutly crossed herself, muttered some invocation or exorcism, and sprinkled the water gently over them. Then walking quietly round and round the hut, she continued her aspersion on the marauders, and thereby literally so damped their ardour that they began to beat a retreat, and in ten minutes not an ant was to be seen.
>
> Some years afterwards I was residing in a farm-house on the river Daule, near Guayaquil, when I witnessed a similar invasion. The house was large, of two stories, and built chiefly of bamboo-cane—the walls being merely an outer and an inner layer of cane, without plaster inside or out, so that they harboured vast numbers of cockroaches, scorpions, rats, mice, bats, and even snakes, although the latter abode chiefly in the roof. Notwithstanding the size of the house, every room was speedily filled with the ants. The good lady hastened to fasten up her fresh meat, fish, sugar, etc., in safes inaccessible even to the ants; and I was prompt to impart my experience of the efficacy of baptism by water in ridding a house of such pests. "Oh," said she laughingly, "we know all that; but let them first have time to clear the house of vermin; for if even a rat or a snake be caught napping, they will soon pick his bones." They had been in the house but a very little while when we heard a great commotion inside the walls, chiefly of mice careering madly about and uttering terrified squeals; and the ants were allowed to remain thus, and hunt over the house at will, for three days and nights, when, having exhausted their legitimate game, they began to be troublesome in the kitchen and on the dinner-table. "Now," said Doña Juanita, "is the time for the water cure"; and she set her maids to sprinkle water over the visitors, who at once took the hint, gathered up their scattered squadrons, reformed in column, and resumed their march. Whenever their inquisitions became troublesome to myself during the three days, I took the liberty to scatter a few suggestive drops among them, and it always sufficed to make them turn aside; but any attempt at a forcible ejectment they were sure to resent with tooth and tail; and their bite and sting were rather formidable, for they were large and lusty ants. For weeks afterwards the squeaking of a mouse and the whirring of a cockroach were sounds unheard in that house.

In their general economy and behavior, the African Dorylini differ but little from the Ecitonini, as can be seen from various descriptions of their marauding columns quoted in Prof. Wheeler's Report of the Congo ants (pp. 46–49). It may, however, be noted that their armies are apparently much more populous than those of the ecitons and also more troublesome when invading human dwellings. A rather successful method of keeping them away from inhabited places consists in making a barrage of hot ashes across their highways.

Whoever has seen the almost fabulous numbers of individuals in the ant armies of the tropics can have no doubts as to the benefit they afford the vegetation by destroying caterpillars and other noxious insects. Since it is evidently the general impression that driver ants indiscriminately destroy all "pests" within their reach, I should like to call attention to some curious experiments with Dorylini made by Swynnerton (1916) in South East Rhodesia. His observations indicate how careful one must be in applying general formulæ to the interrelations of living beings. After giving an impressive account of the columns of driver ants (*Dorylus nigricans* variety *molestus* Gerstæcker) which "seize on any potential prey, from a minute beetle to a cow, that is so foolhardy as to approach them," Swynnerton describes with much detail his experiments to ascertain whether any non-flying insects are safe from these marauders. The unexpected conclusion was reached that these ants show strong preferences "readily taking some animals when they would not take others at all, and when failing in their attacks on yet others." Among the insects left unharmed by the ants of one of the columns were certain beetles (*Mylabris*, *Epilachna*) and caterpillars (*Amauris*, *Acræa*). "A small sciarid fly (*Apelmocreagis thoracica* Macq.) had been settled on the ground right amongst the ants, neither taking any notice of them nor drawing an attack. I captured and disabled it and placed it back amongst them, but tho numbers, I might say hundreds, inspected it, often passing their antennæ over it, all moved on and no attack whatsoever was made." The eggs and very young larvæ of most Rhopalocera experimented with were found to be quite unacceptable to driver ants.[1]

Swynnerton's experiments, however, do not materially detract from the total of the highly beneficial activity of the driver ants which, indeed, are a blessing to all tropical cultures. As Vosseler (1905, p. 298) states, "in a given time they destroy more insect vermin than all other insect-eating animals (birds, lizards, turtles, frogs, spiders, etc.) together, since they clean out to a certain depth the entire field invaded by them." The invasions of these Huns of the insect-world should be welcomed by all agriculturists in tropical regions, even if their pugnacious character and great numbers make them troublesome at times to human beings and domestic animals.

In Europe, foresters generally believe, apparently with good reason, that trees which attract ants or are surrounded by ant nests are less subject to the attacks of caterpillars and other noxious insects.[1] The very populous colonies of certain species of *Formica* prove most valuable in this respect. Forel has calculated that a large colony of the European *Formica rufa* daily destroys at least 100,000 insects. Certain plants possess various organs, such as nectaries and myrmecodomatia, which are often utilized by the ants. Whether these structures are intended merely to allure the ants which would thus form a body-guard to the plant, as Delpino and other botanists have believed, is a much discussed problem and will be considered more in detail elsewhere.

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[1] Messrs. Lang and Chapin inform me that, according to their observations, driver ants are unable to take hold of the larvæ of *Dermestes*, evidently due to the abundant coating of hairs and also to the manner in which these larvæ can bend their body. They frequently witnessed the unsuccessful attempts of one or even several driver ants to grasp a *Dermestes* larva.

The protection afforded to the vegetation by many ants is so evident that it has been employed by some of the most progressive agricultural people, such as the Chinese and the Malays.[2] In Southern China and Indo-China it is an ancient custom to place the nests of certain insectivorous ants in the trees; in this way orange and mandarine trees are said to be kept free from caterpillars (McCook, 1882). Such use was recorded as early as 1640, and Emery identified the ant in question as *Œcophylla smaragdina*, the common silk ant or red tree-ant of the Old World tropics.[3] The Javanese of certain districts use ant nests, again probably those of *Œcophylla*, to protect their mango-trees from fruit-boring weevils, *Cryptorhynchus mangiferæ* (Fabricius), and, in order to give the ants a broader field for their activities, the various trees of a plantation are connected by means of bamboos (Vorderman, 1895).[4] The benefit derived from the presence of the predaceous *Œcophylla* is, however, partly offset by the fact that these ants usually keep coccids and peculiar caterpillars within their own nests, as shown by many observers (F. P. Dodd, 1902; Maxwell-Lefroy and Howlett, 1909, pp. 230–231; G. R. Dutt, 1912; Keuchenius, 1914*a* and 1914*b*).

Various attempts by agriculturists to make a more direct use of protection by ants have not thus far proved very successful. Perhaps many of these experiments have failed from lack of proper knowledge of ant behavior. The Guatemalan kelep-ant, *Ectatomma tuberculatum* (Olivier), introduced some years ago into Texas for the purpose of exterminating the cotton boll weevil (*Anthonomus grandis* Boheman), apparently has not in any way helped control this ill-reputed pest.[1] *Solenopsis geminata* (Fabricius), the "fire-ant" of the warmer regions of the world, apparently is a much more powerful enemy of the boll weevil (W. D. Hunter, 1907; W. E. Hinds, 1907). In certain parts of Brazil, the "formigas cuyabanas," *Prenolepis fulva* Mayr,[2] are considered very effective in fighting the leaf-cutting ants ("saúvas" or Attini), though there seems to be but little foundation for this belief (H. v. Ihering, 1905 and 1917; A. da Costa Lima, 1916). F. v. Faber (1909) claims that in Java "a black ant, 3 to 4 mm. long," but not otherwise identified, successfully controls the bugs of the genus *Helopeltis* in cacao plantations. Perhaps this is *Dolichoderus bituberculatus* Mayr, an ant which, according to de Lange (1910) and Moorstatt (1912), is used in Java to combat these same *Helopeltis* of cacao.

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[1] Ratzeburg, 1844, III, p. 42; 1866, I, p. 143; 1868, II, p. 429. Judeich and Nitsche, 1895, I, p. 717.

[2] Popenoe (1921) has recently called attention to the use of certain unidentified ants by the Arabs of Yemen to combat insects noxious to date-palms. He quotes P. E. Botta [1841, 'Relation d'un voyage dans l'Yémen,' (Paris), p. 155] who says he verified the fact and who credits Forskål with having first observed it about 1764. In Forskål's posthumous work, however, edited by Niebuhr [1775, 'Descriptiones animalium quæ in itinere orientali observavit,' (Copenhague), p. 85], under the name *Formica animosa* the following rather obscure statement appears: "Welcome to gardeners because of the useful animosity with which it pursues the 'Dharr' ants perniciously infesting *Phœnix dactylifer*. To this war it is led by heaping up 'Heml' (camel excrement) as its imperial reward." I have been unable to find additional information on this subject in Niebuhr's account of his travels with Forskal in Arabia [in Pinkerton, J., 1911. 'A general collection of the best and most interesting voyages and travels' (London), X, pp. 1–221].

[3] Emery, C., 1889, p. 15 of separate. Emery received his specimens from Bangkok. Dr. C. W. Howard recently sent Prof. Wheeler ants used for similar purposes by the Chinese near Canton; they also belong to *Œcophylla smaragdina*.

[4] In the Congo the silk nests of *Œcophylla* are very frequently found in fruit-trees and in coffee and rubber plantations.

According to Rothney (1889, p. 355), two ants, *Monomorium salomonis* (Linnæus) and *Solenopsis geminata* (Fabricius), are deliberately introduced into warehouses in Madras to check the depredations of white ants. "This practice is not uncommon in Northern India and the natives of India are familiar with the kind of ant which should be brought in" (Maxwell-Lefroy and Howlett, 1909, p. 226).

Another service of ants which should not be overlooked by ecologists is their ceaseless activity in excavating, transporting soil particles, and hastening the decay of organic substances. Their multiple burrows, extending in all directions underground, bring about a very thorough ventilation of the soil and an easy and even distribution of moisture. They comminute and bring to the surface a large quantity of soil and subsoil, often from a considerable depth, and leave it exposed to the weathering action of the meteoric agents. Furthermore, they introduce into their subterranean excavations much organic matter which thus more readily decays and in turn yields acids that act upon the soil.

Owing to the hidden habits and minute size of most ants, their importance as geologic agents may be easily lost sight of, especially in temperate regions. In tropical and subtropical countries the result of their toil is often much more apparent, though it rarely approximates that produced by termites. Only certain species of *Formica* in temperate Europe and North America construct mound or hill nests of sufficient size or number to attract much attention; with them, the accumulations consist of a small part of excavated soil, most of the material being gathered in the vicinity by the workers. The conical mounds of the North American *Formica exsectoides* sometimes reach a meter in height and two to three meters in diameter at the base, while those of the European *F. rufa* often are much larger (over two meters high and eight to ten meters in diameter).

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[1] See various papers by O. F. Cook (1904, 1905, and 1906) and their criticism by Wm. M. Wheeler (1904, 1905a, and 1906). A list of ants known to prey on the cotton boll weevil is given by W. Pierce (1912, pp. 69–73).

[2] Also called "*formigas cearenses*" or "*formigas paraguayas*"; various other species of ants are occasionally taken for "*cuyabanas*."

The crater-shaped or conical mounds of certain North American harvesting ants are partly made of earth brought from underground excavations. Those of *Pogonomyrmex barbatus* subspecies *molefaçiens* may attain one to two meters in diameter and fifty centimeters in height, while in the common *P. occidentalis* they are but little smaller and often form extensive colonies (Headlee and Dean, 1908; Wheeler, 1910). *Ischnomyrmex cockerelli*, of the southwestern United States, surrounds the entrance to its nests with huge craters, from sixty centimeters to two meters in diameter and from 0.2 to 0.5 centimeters in height, built of coarse desert soil intermingled with pebbles sometimes two centimeters in diameter (Wheeler, 1910, p. 281).

The volume of material moved by some of the leaf-cutting ants (Attini) of tropical America is much greater than in any of the cases mentioned above. H. v. Ihering (1882), Gounelle (1896), and Branner (1896, 1900, 1910, 1912) have called attention to the importance of these insects as geologic factors. In certain parts of Brazil the ant hills of the saúva (*Atta* species, probably *cephalotes*) are so large and numerous that they become a remarkable feature of the landscape. At one place in the Rio Utinga region, in the interior of Bahia, where the forest had been cleared away so that the mounds were visible, Branner counted fifty-three of them within an area of 10,000 square meters. Their bases covered close to one-fifth of the total space under consideration and their volume was estimated at 2225 cubic meters. The cubical contents of the mounds, if evenly distributed over the entire 10,000 square meters, would have been 22.25 centimeters thick. In this case, the height of the ant hills varied from 1.2 to 4.5 meters, with an average of 2.5 meters. These were not the largest seen, for on the upper drainage of the Rio Utinga, Branner measured mounds of leaf-cutters five meters high and sixteen or seventeen meters in diameter at the base, each containing about 340 cubic meters of earth. The illustrations in Branner's latest papers (1910, 1912) remind one of strikingly similar landscapes with scattered termite hills in many parts of tropical Africa (see Pl. XV). A considerable amount of living vegetable matter is carried by the leaf-cutting ants into the inner chambers of their nests, where it is cut up and worked in their mushroom-beds; vegetable substance is thus rapidly transformed into mineral matter and rendered available to new plant-growth.

True mound- or hill-building ants are not found in tropical Africa; many species, however, build small crater-shaped accumulations of earth at the entrance to their nest. Those of the seed-storing *Messor* are often very conspicuous in the arid parts of the continent; their craters sometimes measure a meter or more across and the earthen walls may reach twenty-five centimeters in height (Passarge, 1904, pp. 290–295; see also the photograph of a nest of *Messor* species taken by Mr. Lang on the Athi Plains, British East Africa, Pl. XXVI, fig. 1). The driver ants, when establishing their temporary abodes, often excavate considerable quantities of soil, as is shown by Mr. H. Lang's photograph of a nesting site of *Dorylus* (*Anomma*) *wilverthi* Emery (Pl. II).

The following chapters deal with many other activities by which ants come into direct contact with plants. They will further emphasize the importance of ants in the economy of nature, in which they must undoubtedly be regarded as the dominant insects (Wheeler). From the narrow point of view of human interests, by far the greatest number of ants are indifferent or negligible organisms, either because of their small size and scarcity of their colonies, or because they avoid the vicinity of man's activities. With regard to the comparatively few species that are of economic importance, "a consideration of all the facts forces us to admit, with Forel, that as a group ants are eminently beneficial and that for this reason many species deserve our protection. Some of our species, however, are certainly noxious, and these offer strong resistance to all measures for their extermination, owing to the tenacity with which they cling to their nesting sites, their enormous fertility and the restriction of the reproductive functions to one or a few queens that are able to resist destruction by living in the inaccessible penetralia of their nests" (Wheeler, 1910, p. 8).

Ants as Agents in the Pollination of Flowers

In Knuth's celebrated 'Handbook of Flower Pollination'[1] ants are dismissed with the brief statement that they "frequently occur as ravagers of flowers, for which reason Lœw has termed them *dystropous*."

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[1] English translation, (Oxford), 1906, I, p. 168.

Perhaps even in temperate zones this is not entirely true, and it is difficult to believe that, in Umbelliferæ and other flower associations with freely exposed nectar on which ants are most commonly met with, these insects are not at least effective agents of geitonogamy. In the tropics, moreover, ants are so abundant everywhere that very likely they are of even greater importance as carriers of pollen, the more so since many trees and shrubs of tropical forests bear flowers on their old wood on the very highways of the ants, so to speak. One might even venture to suppose that cauliflory is mainly of use to the plant in that the flowers are thus placed within easy reach of pollinating ants. Indeed, the question as to the origin and significance of cauliflory in tropical trees and shrubs has not thus far been satisfactorily answered. Wallace[1] regards it as an adaptation to pollination by butterflies, which, he says, keep to the undergrowth of the forest and rarely ascend to the crown of the trees. Haberlandt (1893, p. 132) argues that many of the caulinary flowers are dull colored and also otherwise but little adapted to Lepidoptera, and, from my personal experience in the Ituri forest, I must agree with him. I cannot recall a single instance in which I saw caulinary flowers visited by butterflies and I greatly doubt whether Wallace's explanation was founded on actual observation. In Haberlandt's opinion, cauliflory is merely the result of a tendency to a more complete division of labor, resulting in a sharper differentiation between the assimilating and the reproductive parts of the plant. Evidently A. F. W. Schimper (1903, p. 338) is also satisfied with a mere physiological solution when he supposes that the frequent occurrence of cauliflory among tropical trees is due to a weaker development or slighter degree of roughness of the bark.

The foregoing remarks will suffice to show that the relations between ants and cauliflorous plants are worthy of further attention. In his biological studies of tropical flowers, H. Winkler (1906) enumerates a number of plants in Cameroon which he asserts are pollinated by ants, though he does not enter into details nor describe any adaptations of the flowers to this peculiar mode of fecundation. It is interesting to note that most of the species thus mentioned by Winkler are cauliflorous trees or shrubs. The cacao tree (*Theobroma Cacao*) affords a classical illustration of cauliflory, its flowers being borne on both stem and main branches; in this case G. A. Jones (1912), from his experiments carried on in Dominica, West Indies, has reached the conclusion that ants are in all probability the chief agents of pollination.

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[1] 1891, 'Natural selection and tropical nature,' (London), p. 244.

H. N. Ridley (1910, pp. 461–462) has made some interesting observations in Singapore on certain species of the anonaceous genus *Goniothalamus*, notably *G. Ridleyi* King, which produce their flowers in masses at the base of the tree.[1]

> The flowers are of large size and dull reddish in color. They are almost invariably covered by a nest of very small black ants, which pile up powdery soil all over them, so that they are often quite concealed. It would, I think, be difficult for a bee or other insect to get to the honey of these flowers through the nest, yet I think no species of the genus fruits so regularly or heavily as does *Goniothalamus Ridleyi*. That the ants are distinctly attracted by the flowers, is clear from the fact that the flowers from the trunk which are too high up for the ants to cover with the nest are generally densely covered by a swarm of the insects. Owing, however, to the minuteness of the ants and the difficulty of making observations in such a mass of them, I have been unable to definitely decide whether the ants do actually fertilize the flowers by conveying the pollen from one to the other, but I can not see any other way in which the fertilization can be effected. The ants generally throw up the mounds over the flowers before the buds open, as if in anticipation of the honey within the flowers. In most species of the genus the flowers are borne on the branches or upper part of the stem, and are brighter in color, white or orange, and these are not haunted by ants, but doubtless fertilized by hymenopterous or dipterous insects. If the flowers of *G. Ridleyi* are, as I believe, fertilized by ants, their position at the base of the stem may be taken as a modification to that end. This, however, could not be classed as symbiosis, but rather as a modification for fertilization, as the main nest of the ants is apparently always underground near the tree.

Ants and Extrafloral Nectaries

Under the term "extrafloral nectaries" botanists include all glands secreting saccharine substances located on the vegetative organs of plants, while the "floral nectaries" are similar nectar-secreting glands found on parts of the flower or of the inflorescence.[2] There is still considerable discussion as to the true significance of nectaries. In this connection it is rather interesting to observe that all earlier botanists regarded even the floral nectaries as having a physiological function. Some believed that the saccharine secretion accumulated in the flowers served to feed the embryo; others considered the nectaries as excretory organs, eliminating waste substances of no further use or perhaps even noxious to the plant. In later years the majority of naturalists have accepted none but an ecological explanation. That the nectar glands of flowers attract pollinating insects, which in turn assure or greatly facilitate cross-fertilization, is too well established a fact to be doubted. It is, however, by no means certain that these floral nectaries are not at the same time more directly useful to the plant in a physiological way.[1]

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[1] M. S. Evans (1876) has described cross-pollination by means of ants in an unnamed rubiaceous shrub on the coast of Natal.

[2] Delpino (1874 and 1875) proposed to replace these terms with "extranuptial" and "nuptial" nectaries respectively. A "nectary" was originally defined by Linnaeus (1751, 'Philosophia botanica,' p. 53) as that part of the flower which produces the honey ("*nectarium, pars mellifera floris propria*"). Usage has extended the meaning of the word to apply to all glands of the plant producing sweet excretions. Caspary (1848, 'De nectariis') [illegible] apparently first made the distinction between floral and extrafloral nectaries. The historical side of the question has been fully treated by G. Bonnier (1879).

Ants are frequently seen busily visiting the extrafloral nectaries of certain plants. They are, for instance, seldom absent from the large stipular glands of certain species of *Vicia* (*V. sepium*, *V. sativa*, and *V. Faba*) in Europe (see Rathy, 1882, pp. 29-36; Hetschko, 1908). In North America the stipules of some species of *Cassia* are especially attractive to these insects. In the Belgian Congo, I have taken numbers of ants, together with many other Hymenoptera and Diptera, as they were sucking up the sweetish fluid secreted at the base of the leaf-blade of *Urena lobata* variety *reticulata* Guerke, a very common weed in native villages and cultures.[2] The foliar nectaries of several Javanese species of *Hibiscus* are also very inviting to ants (Kœrnicke, 1918). It is on similar observations that Delpino (1874, 1875, 1879), A. F. W. Schimper (1888), and Kerner von Marilaun (1876) based their ecological interpretation of extrafloral nectar glands. The following passage from Delpino's earliest paper (1874, pp. 237-238) may be reproduced in full, as it sums up his views:

> What then is the function of the extranuptial nectaries, which are found on the caulinary leaves, on the bracts, and on the calyx? Though I reserve for another paper the publication of my studies of such and other extradichogamic relations between plants and insects, I do not hesitate to announce now that the chief function of these nectaries is to place the ants, wasps, and *Polistes* in the position of sentries and guards, to prevent the tender parts of the plant from being destroyed by larvæ. Where ants and wasps are present, larvæ cannot exist because they will be devoured. Thus certain plants have adopted the same means of defense and bait that we see used by the tribe of aphids, coccids, *Tettigometra*, and other cicadellids, which spontaneously place themselves under the powerful protection of ants. Still another function, though a subordinate one, can sometimes be carried on by the above-mentioned nectaries, namely that of keeping the ants from the nuptial nectaries by detaining them at the extranuptial nectar glands. Indeed we can ascertain the noxious effects of ants when they succeed in infesting the flowers. In the first place, ants have sedentary habits, remaining motionless for whole hours on the same flower; therefore, they are of no use in dichogamy. Secondly, ants are objects of fright and aversion to the natural pollinating insects of the plant, as for instance, flies, butterflies, and bees; hence, their presence on the flowers renders useless the dichogamic devices of these plants. I have repeatedly observed bees and bumble-bees avoid visiting flowers when they saw ants there. Which all makes it clear how plants under given circum-

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[1] G. Bonnier (1879, p. 206) after a critical study of the subject, from an anatomical and a physiological viewpoint, concludes: "The nectariferous tissues, whether floral or extrafloral, whether or not producing a liquid externally, represent special food reserves directly connected with the life of the plant."

[2] See my notes on this plant in Rev. Zool. Afr., III, fasc. 1, 1913, p. 3.

> stances may find great profit in producing extranuptial nectaries, either to secure permanent and bold guards against the invasions of larvæ or to lure the ants away from the flowers.

In some of his later publications Delpino has even proposed that all plants with extrafloral nectaries be regarded as myrmecophytes, and has followed this course in his elaborate 'Monograph of the Myrmecophilous Function in the Vegetable Kingdom' (1886–1889). Such an extreme view has not been accepted by many other naturalists, probably because it would extend the concept of myrmecophytism to include a very considerable portion of the world's flora.[1]

A. F. Schimper and Kerner von Marilaun fully endorse Delpino's theory and endeavor to give further evidence in its support. Kerner, for instance, has a clever explanation of how the involucral nectar glands of certain Compositæ attract ants which defend the capitula against voracious beetles.[2] He has also built further on the idea that the extrafloral nectaries keep ants away from the flowers where they would come as "unbidden guests" to feed on the floral nectar without aiding in cross-pollination. He claims that ants climbing the plant thus find on their way up an ample and readily accessible supply of honey, and consequently do not trouble to go to the flowers.

Many objections can, however, be raised to Delpino's theory. First, myrmecologists will not readily admit Kerner's supposition as to the limitation of the ants' feeding propensities. As a matter of fact, these insects are sometimes found inside flowers of various types, and frequently so on those with freely exposed nectar, such as the Umbelliferæ. In tropical regions at least, as I have suggested above, they should not be wholly disregarded as pollen carriers. Secondly, observation shows that the extrafloral nectaries, while present in a great number of species, are in many of them seldom if ever visited by ants. Thirdly, the visitors of extrafloral nectar glands especially attractive to insects frequently do not consist of ants only, but include various other Hymenoptera, Diptera, and Coleoptera, which are by no means deterred by the ants.[3] And lastly, it has not been sufficiently well established that the presence of the "body-guard" of ants actually favors the species or individual plant on which they are found, though it cannot be denied that, when present in large numbers, they give to the plant a certain amount of protection.[1]

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[1] O. F. Cook's papers on the "kelep" ant offer a typical example of the lengths to which "myrmecophilism" may be carried by certain naturalists. According to this author (1904 a, p. 866) the cotton-plant of eastern Guatemala has, through its extensive system of extrafloral nectaries, secured the active coöperation of the kelep or weevil-eating ant, *Ectatomma tuberculatum* (Olivier), against the boll weevil!

[2] The nectar glands at the involucral bracts of certain Compositæ have been further investigated by v. Wettstein (1888) and Hetschko (1907). The last-named observer found that the sweet excreting bracts of the European *Centaurea montana* Linnæus are visited not only by ants (*Myrmica lævinodis*, *M. rugínodis* and *Lasius niger*) but also by other Hymenoptera (Apidæ, Vespidæ), Diptera, and Coleoptera.

[3] Hetschko (1908) gives a list of the visitors he observed at the stipular nectaries of *Vicia sativa* Linnæus. It includes, in addition to four ants (*Formica rufa*, *F. rufibarbis*, *Lasius niger*, and *Myrmica lævinodis*), 24 species of Hymenoptera (6 Apidæ, 4 Vespidæ, 2 Sphegoidea, 10 Ichneumonidæ, and 2 Tenthredinidæ), 21 of Diptera (8 Syrphidæ, 12 Muscidæ, and 1 Bibionidæ), 8 of Coleoptera (3 Cantharidæ, 2 Elateridæ, 1 Phalacridæ, and 2 Coccinellidæ), and 1 of Hemiptera.

The so-called "food-bodies" of the myrmecophytes *Acacia sphærocephala* (Beltian bodies) and *Cecropia adenopus* (Müllerian bodies) are probably also of glandular origin (F. Darwin, 1876); they are described in my synopsis of the myrmecophytes (p. 503). Such structures are by no means restricted to certain typical ant-plants. *Leea hirsuta* Blume, a common Javanese bush of the family Ampelidaceæ, produces spherical excrescences on the tender parts of the plant, in abundance on the young petioles, also on the young leaf-blades near the midrib and on the stem of young shoots. These glandular bodies, about 0.7 mm. long, consist of an outer layer of small cells enclosing much larger cells filled with oil drops and albuminoid granules. They are eagerly collected by ants and consequently often difficult to find on the plant (Raciborski, 1898). A similar case is that of *Pterospermum javanicum* Junghuhn, one of the Sterculiaceæ in Java, which bears in its funnel-shaped stipules minute food-bodies also collected and carried away by ants (Raciborski, 1900). In both these cases other species of the same genus lack these food-bodies completely. Since neither *Leea hirsuta* nor *Pterospermum javanicum* possesses myrmecodomatia, they could not well be regarded as true myrmecophytes, no more than the many plants which are merely provided with extrafloral nectaries. Their case offers a suggestive comparison with the Müllerian and Beltian bodies and weakens the argument that the last-named growths are myrmecophilous organs connected with the presence of ant-dwellings in *Cecropia adenopus* and *Acacia sphærocephala*.

It thus seems that, from the point of view of the myrmecologist, extrafloral nectaries and "food-bodies" are little more than additional sources of food which ants are so keen in detecting and in exploiting to the very limit. All ants are fond of sweets and this is especially noticeable in species with a vegetarian or semi-vegetarian diet. In many cases the sugary juices are absorbed so eagerly by the workers that their crop distends considerably and the gaster is temporarily inflated to a size entirely out of proportion to the rest of the body. Extreme instances of the kind are the so-called "honey ants" of the arid plains and deserts of North America, South Africa, and Australia. In certain ants of these regions some individuals of the worker caste have developed into a special form of "repletes," which act as living reservoirs of liquid food for the purpose of tiding over periods of scarcity. Their "honey" is obtained from the excretions of various Hemiptera (see p. 336) and the sweet exudations of different plant organs and even of certain galls. A few years ago Wheeler published a complete account of the honey ants (1908*b* and 1910*b*, pp. 361–377), to which but little can be added at present.

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[1] A comprehensive criticism of Delpino's theory of extrafloral nectaries has been given by Mrs. M. Nieuwenhuis von Uxküll-Güldenbrandt (1907).

Repletes have been described for the African *Plagiolepis trimenii* Forel,[1] discovered by Hutchinson in Natal. They are 6.5 mm. in length, of which the head and thorax together measure only 2 mm., and are said by Forel (1895) to have their gaster "distended with honey, like a round cyst, transparent, as large as a hemp seed, on which the chitinous laminæ of the segments appear like islands. The anterior portion of the first segment has a hollow depression into which the petiolar scale fits. With the aid of a lens it is possible to distinguish, below and behind, the stomach and gizzard with its reflected calyx, both of them displaced and flattened against the gastric wall." The gaster in these repletes is, according to the same author, nearly as fully distended as that of the North American *Myrmecocystus melliger*, and locomotion must be almost impossible for this insect.

The habit of using some of the members of the colony as honey pots will probably be discovered in certain other ants of the African deserts. Among other species it may be still in an incipient stage, as, for instance, in the case of *Acantholepis arnoldi* Forel in Southern Rhodesia. The nests of this ant are found in loose, sandy soil in the hottest places. They sometimes contain workers with gaster considerably swollen, as long as the head and thorax together, but not so rotund as in the repletes of *Myrmecocystus* or *Plagiolepis trimenii* (Arnold, 1920, p. 564).

Dispersal of Seeds by Ants

That certain ants gather seeds and preserve them in special granaries in their nests has been known since very ancient times. There are frequent allusions to harvesting ants, and even more or less accurate accounts of their activities, in the writings which have come down to us from the older civilizations along the shores of the Mediterranean.[2] Yet such keen myrmecologists of western Europe as Latreille and P.

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[1] *Plagiolepis decolor* Emery, a very closely allied South African species, is, according to Forel, also a honey ant.

[2] These old accounts are given in the works of Moggridge (1873, pp. 5–11) and McCook (1879*a*, pp. 42–60).

Huber, unacquainted with the spectacular seed-storing habits of certain southern ants, discredited the assertions of the ancient writers. Though Sykes (1835) and Jerdon (1851) in India and Buckley (1861*a*) and Lincecum (1862) in North America had actually observed certain ants collecting large quantities of seeds, it needed the careful investigations of Moggridge (1873) in southern France and of McCook (1877 and 1879*a*) in Texas to dispel the skepticism of modern entomologists.

It is only more recently, however, that naturalists have come to appreciate the general importance of ants as seed distributors. Their rôle in this respect seems to have been first realized by Kerner von Marilaun (1895, pp. 866–867). Later F. Ludwig (1899, p. 38) definitely asserted that "ants do not only aid in scattering plant seeds, but that they play a prominent part in the dispersal of the indigenous (European) vegetation." In Sernander's comprehensive 'Monograph of European Myrmecochores' (1906*b*) one finds a detailed and critical history of the subject, together with an immense array of new and interesting observations. His conclusions show that in Europe a great many grasses and herbaceous plants rely almost exclusively, or at least to a large extent, on certain species of ants for the successful scattering of their seeds. Many of the more common ants, belonging to such ubiquitous genera as *Formica*, *Lasius*, *Tetramorium*, and *Myrmica*, gather seeds of various plants more or less consistently. To the phytecologist these widely distributed ants are perhaps factors of greater importance than the true harvesters. The latter, to be sure, are more spectacular in their performances, but they are restricted to certain desert or semi-arid regions and are evidently extreme cases, remarkable for the huge quantities of seeds stored in their granaries.

The ecological significance of seed-transporting ants can only be adequately realized upon closer scrutiny of the actual results of their activity in this line. Sernander's calculations, though based on moderate figures, show that the amount of seeds carried about by ants must be considerable. He found, for instance, that a single colony of *Formica rufa* transports during one season about 37,000 seeds and fruits. Observation also discloses that the seeds are in this way conveyed appreciable distances (100 to 200 feet) from the mother-plant. On their foraging excursions ants frequently drop or lose seeds along the road. Furthermore, many of the seeds finally stored in the recesses of the nest are sooner or later cast out near the entrance along with chaff and other débris from the ants' household, and a number of them are still able to germinate. Finally, with further investigation, the number of myrmeeochores, or species of plants whose seeds are garnered by ants, increases steadily.[1]

One might reasonably surmise that in tropical countries too ants will be found to be efficient agents in the dispersal of the seeds and fruits of many species; but, as yet, this side of tropical ant behavior has been barely touched upon. O. Kuntze (1877, p. 24) mentions incidentally that in South America he saw ants carry off the seeds of papaw-trees (*Carica Papaya* Linnæus). R. H. Lock (1904) gives a short account of the dispersal in Ceylon of *Turnera ulmifolia* Linnæus by ants (*Pheidole spathifera* Forel) which are apparently attracted by the arillus of the seed. More recently, W. and J. Docters van Leeuwen-Reynvaan (1912) have carefully investigated the scattering of the seeds of *Dischidia Rafflesiana* Wallich and *D. nummularia* R. Brown, which are common epiphytes in Java. The pappiferous seeds of these Asclepiadaceæ bear a narrow, white caruncle of thin-walled cells filled with fatty and albuminous substances. When the fruits are ripe, they split open and the seeds are carried away by the wind; if they lodge on a branch or trunk, they germinate when sufficiently moistened, but such seedlings do not develop into adult plants. Plenty of healthy seedlings can, however, be found in the galleries of *Iridomyrmex myrmecodiæ* Emery, an ant which builds its nest on and in the bark of trees. Moreover, this ant has been seen in the act of transporting *Dischidia* seeds, to which it was probably attracted by the caruncles. These minute ants, being unable to grasp the seed itself, pull off the longer, fragile hairs of the pappus and by means of the shorter, stronger hairs, drag the seed into a slit in the bark or among the roots and stalks of other *Dischidiæ*. It may be noted that in Java the pitcher-shaped leaves of these species of *Dischidia*[2] are usually inhabited by the same *Iridomyrmex*, so that this is perhaps one of the clearest examples of true symbiosis between ants and plants. It would be important to investigate further whether the ants actually feed on the caruncles of the seeds. The case of *Dischidia* also suggests comparison with the "ant gardens" of the Amazon, which are considered in more detail elsewhere (p. 365).

Ule (1900, p. 123) records finding the pea-sized seeds of *Ipomœa pes-capræ* Linnæus lying in long rows on the sandy sea-shore at Copacabana, near Rio de Janeiro; he saw leaf-cutting ants (Attini) moving along, each carrying one of the seeds into a hole. It would thus seem that the Attini also store seeds in their nests or perhaps use them in their fungus gardens.

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[1] Speaking of the seed-transport by *Messor barbarus* in Arbe, an island in the Adriatic Sea, F. Neger (1910a, p. 130) writes: "If one would draw up a list of all the plants whose seeds or fruits are carried by *Messor* into its nests, this list would almost be equivalent to an enumeration of the flowering plants occurring on the island."

[2] Ridley (1910, pp. 462-465) concludes that *D. Rafflesiana* cannot be regarded as a true myrmecophyte, but the relations between the ants and the seeds of this plant escaped his notice, so that the question will bear still further study.

H. Winkler's (1906, pp. 236–237) statements concerning the dispersal of seeds by ants in Cameroon do not enter into much detail and merely show that the rôle played by ants in this respect in tropical Africa should not be disregarded. He says that in the dispersal of "numerous dry fruits with small seeds, ants are undoubtedly also ot significance, since no spot in the tropical Rain Forest is free from these insects. I have almost always found that the arilli on dropped seeds of *Blighia* and other Sapindaceæ had been eaten away by ants. I have, however, never seen flower-gardens (due to ants) in Cameroon."

Harvesting Ants

The reader will find a complete review of this fascinating subject in the chapter devoted to harvesting ants in Prof. Wheeler's ant-book (1910*b*, pp. 267–293). The following account, therefore, will deal with what little is known at present of the seed-storing ants in the Ethiopian Region.[1]

The typical Old World harvesters of the genus *Messor* are at home in the desert and semi-arid parts of the southern Palearctic, of the Ethiopian, and of the Indian Regions (Map 45). It is noteworthy that in Africa these ants, though widely distributed over the dry parts of the continent, avoid the moist West African Region (Engler's Western Forest Province), where seed-storing on a large scale is rendered practically impossible by the great moisture which prevails throughout the year, or at least for long periods, and would soon cause the stored seeds to sprout. Though *Messor* occurs as far north as Mossamedes and Bulawayo, as far west as the Great Rift Valley, and has recently been taken at Fort Crampel, French Congo, it has not been recorded from anywhere within the Congo Basin; yet it is not impossible that some of its forms might be found in Katanga. In East Africa this genus has the same general habits as in the Mediterranean Region (see Moggridge, 1873), as far as can be gathered from Sjöstedt's account of *Messor cephalotes* Emery, observed by him at the northern foot of Mt. Kilimanjaro:

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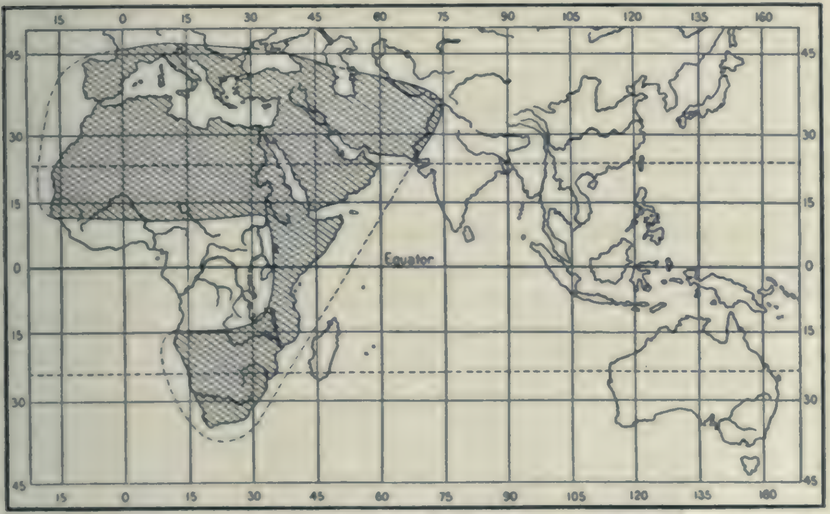
[1] Additional observations on the harvesting ant *Messor barbarus* subspecies *meridionalis* (Ern. André), in Macedonia, have recently been published by F. D. Doflein (1920).

At several spots one could see cleared spaces amidst the dry grass where every grass-stalk had been removed and the red-brown soil lay open to view, plane and clean as a well-attended garden plot. Such places were somewhat variable in size, mostly up to about 6 paces across and nearly circular. Heaps of fine grass-stalks cut to pieces (one to several liters; often 2 to 3 cm. long), together with grass panicles, were lying around. Scattered ants were wandering all over the place, the soldiers being especially striking on account of their big heads. The cleared place showed a large entrance, often more than finger-wide, into which the ants were dragging the stalk cuttings; more in particular I saw soldiers disappear with such cuttings through the entrance. The largest space I saw was 8 paces in diameter, with 4 or 5 separate entrances, one of which was larger than the others (as is the rule when there are many) and surrounded by an irregular, funnel-shaped depression, 15 to 20 cm. deep. The heaps of stalks, elsewhere clean and free from earth, were in this case mixed with soil and did not look as clean as usual. There were also holes in places along the path, into which the ants were dragging grass-stalks cut to pieces." (Mayr, 1907, pp. 14–15.)



Map 45. Distribution of *Messor*, a genus of harvesting ants. A subspecies of *M. barbarus* has recently been described from Fort Archambault, at about 9° 5′ N., 18° 35′ E.

Figure 1 on Plate XXVI represents one of these nesting sites of East African *Messor* from a photograph taken by Mr. H. Lang in the Athi Plains, British East Africa, during the R. Tjäder Expedition (July 1906). It is interesting to learn from Sjöstedt's experience with *Messor cephalotes* in East Africa and that of Neger (1910*a*) with *M. barbarus* in southern Europe that certain species of the genus *Messor* are leaf-cutting. What use these ants may have for the plant cuttings in their nests is as yet unknown.

According to K. Escherich (1911a, pp. 48–51) *Messor barbarus* in Eritrea stays within its nests in the daytime, coming out in numerous columns after sunset to cut off panicles of grass and collect seeds, which are taken home; often pellets of earth or little stones are carried away by mistake. A few workers were also dragging bulblets of a *Cyperus*, probably *C. bulbosus*, which are in this way effectively scattered.[1]

The genus *Pheidole*, abundantly distributed over all tropical and warm temperate regions of the world, is so closely allied to *Messor* that both have been included by Emery in one tribe, the Pheidolini, which also contains many other harvesting genera (*Oxyopomyrmex*, *Goniomma*, *Novomessor*, *Veromessor*, etc.); thus the seed-storing behavior is to some extent rooted into the phylogeny of the group. Certain Indian *Pheidole*, such as *Pheidole providens* (Sykes), are famous as harvesters, and many other members of the genus are also more or less granivorous. Mr. H. Lang and I discovered a typical seed-storing species, *Pheidole saxicola* Wheeler, in the Lower Congo. At Zambi the nests of this ant were placed in the interstices of stones on a rocky hill as shown on Plate VII and described by Mr. Lang in his field-notes (p. 139). From the débris, heaps of chaff, and rejected seeds thrown out by the ants and accumulated near the entrances of the nest, it was seen that the seeds gathered by this *Pheidole* belong chiefly to a few common grasses, such as *Chloris polydactyla* Swartz and various species of *Andropogon*. Concerning the genus *Pheidole*, Arnold (1920, p. 416) remarks that the South African species "are omnivorous, with a marked fondness for sugary substances, but some species, *e. g. excellens*, *crassinoda* and *arnoldi*, are mainly graminivorous, harvesting the seeds of grass in the same way as the species of *Messor*." *P. xocensis* Forel and its variety *bulawayensis* Forel are also mentioned by Arnold (1920, p. 445) as being "at least partly graminivorous, as the nests contained accumulations of grass seeds."

According to Arnold's observations, the commonest harvesters in South Africa are various forms of the genus *Messor* and certain species of *Tetramorium*. In his 'Monograph of the Formicidæ of South Africa' (1920, pp. 409–410), he writes of *Messor capensis* subspecies *pseudoægyptiacus* (Emery) as follows: "This variety is very common in the neighborhood of Bulawayo. It is eminently a harvesting ant, usually collecting the seeds of one particular kind of grass. The rejected husks of these seeds are deposited in a circle all around the entrance of the nest, one-half of the circle being generally deeper than the other, which may be due to the prevailing winds. These rubbish heaps when made by a populous colony sometimes reach very large dimensions, covering as much as one square foot of ground, and from one to three inches deep. The site of such a nest is very plainly indicated by these accumulations, since the husks are bleached almost white by the action of the sun. The nests of this ant appear to be very free of myrmecophilous insects and even the ubiquitous thysanuran is rarely to be found in them. The ants appear to have definite foraging grounds, to which access is obtained by well-marked and smooth paths leading from the nest in various directions." *Tetramorium setuliferum* Emery he describes (1917, p. 291) as "a harvesting and graminivorous species. The entrances to the nests are often surrounded by small accumulations of husks of a grass seed. These heaps are smaller than those of *Messor*, and much less tidily disposed."

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[1] The bulblets of *Cyperus bulbosus* Vahl and *C. esculentus* Linnæus are also occasionally eaten by certain African natives.

The ponerine ants are well known for their predaceous habits and highly carnivorous diet. Yet one at least of these ants, the common African *Euponera sennaarensis* (Mayr), is to a large extent granivorous. Arnold (1913, p. 13; 1915, p. 7) found that the nest of this species in Rhodesia "often contains considerable accumulations of grass seed which may be used as food," though this ant is also a keen hunter of termites. Similar observations have been made on this species by K. Escherich in Abyssinia (Forel, 1910, p. 245) and by myself in Katanga (Bequaert, 1913, p. 421).

There is little doubt that certain ants derive at least part of their sustenance from the seeds which they carry into their nests. Yet it is by no means clear how they manage to utilize the various amylaceous, nitrogenous, and oily substances contained in the seeds, either for their own nourishment or as food for their brood. In the case of the many widespread species which use seeds only in small quantities, as an additional food supply, it would seem that the caruncle alone is bitten off, neither the coats of the seeds nor their contents being touched. This is, however, not the case with true harvesters, some of which have become almost purely granivorous and, as a rule, remove the entire kernel of the seed. In his experiments with a colony of *Messor structor* kept in an artificial nest, Emery (1899 and 1912*b*) found that this ant would more or less readily accept cooked or dried meat, various fresh mushrooms, husked rice, a variety of ripe and unripe seeds, plant buds, bread, and dry vermicelli. These substances would all be to a certain extent triturated between the mandibles, and finally a large or small quantity of residue would be dumped out of the formicary; but the ants steadily refused raw starch.

Emery also made some feeding experiments with a colony of *Messor barbarus minor* kept in an artificial nest of the Janet pattern. He found that this ant is less omnivorous than *M. structor*. It shows a predilection for dead insects; seeds rank only second in its choice, though they often constitute its principal food. When a ripe, dry, and unsprouted grain of wheat is offered to this species, the ants carry it into their nest and sooner or later gnaw off the embryo, always beginning to eat the grain at that end. This curious habit was even known to the ancient writers (Plutarch and others) who consequently attributed to the harvester ants a most wonderful instinct of preventing the sprouting of the grain by removing the germ. Emery, however, has shown experimentally that this is due merely to a matter of taste or gluttony manifested by the ants for this daintiest part of the grain. He believes that the ants mutilate the radicle of sprouted seeds for a similar reason, though he admits that this behavior may be of a more complicated nature.

Harvester ants can thrive perfectly on unsprouted grain, as shown by Emery's experiments, but in most cases they allow a partial germination of the seeds before using them as food. Neger (1910*a*) found that most of the seeds which *Messor barbarus* places in the sun near the entrance to its nest are already partly sprouted; these sprouted seeds are carefully removed from their envelopes and are only carried back into the formicary when thoroughly dry; under such conditions the germ plants are evidently killed. It has been supposed (Moggridge) that the ants allow the seeds to germinate in their nests so the starch will be converted into grape sugar, the whole procedure being somewhat comparable to the malting of grain. Neger, however, discards this explanation because he found that in the sprouted seeds which are placed to dry in the sun the process of germination was not sufficiently advanced to convert any large quantity of starch. He believes, therefore, that the practice of allowing them to sprout has no further purpose than to facilitate the removal of the coatings, which are sometimes very hard to detach from ripe seeds; on sprouted seeds, these envelopes split open and are then easily pealed off by the ants.

Neger has also investigated what happens to the germinated seeds after they have been taken back into the formicaries. He found that, at certain hours of the day, the ants carry out of the nests small, shapeless, pasty masses of a brownish-pink color, which are left to dry in the sun.

When carried out these masses are soft, damp, and bitter to the taste; their size varies from that of the head of a pin to that of a grain of pepper. Microscopic examination shows that they consist of comminuted parts of seeds, plant hairs, fibres, pollen, etc.[1] Neger calls these pasty masses "ant-bread-crumbs" and, although he never saw them being transferred, he supposes that they are eventually carried back into the nest by the ants. In a number of these crumbs he found spores and mycelium of a mould which he identifies with *Aspergillus niger*, having also obtained this fungus in a number of cultures made with fresh "ant-bread-crumbs" taken from worker ants. He formulates the hypothesis that the amylolytic and proteolytic action of this mould may help to render the crumbs more readily digestible so that they can be fed to the young as "larva-bread."

Emery (1912) completely rejects Neger's supposition that the starch and aleurone of the seeds need to be prepared by a ferment before being fed to the larvæ. He offered his colony of *Messor barbarus minor* wheat-paste made up in the form of small rings and found that this substance was readily accepted by the workers, who carried it into the moister part of the nest. There the rings were malaxated for some time and divided into small, twisted pieces, more or less irregular in shape, which were finally dumped into the drier chamber of the nest and never touched again by the ants. Fragments of this paste were also presented by the workers to the larvæ, the largest of which applied their mouthparts to it just as to other food. Emery determined the weight and starch contents of fifty of these paste rings before and after malaxation by the ants. He infers from his figures that the workers either digested or fed to their larvæ at least 7.3 per cent of the starch and that they consumed also an unknown quantity of nonamylaceous substances, probably proteids; the latter he regards as a much more important aliment than the starch.

This brief consideration of the feeding habits of harvester ants may be properly concluded with Emery's remarks concerning the ethological significance of granivorous behavior among the Formicidæ:

> The granivorous ants are derived from insectivorous ants. They represent an adaptation to the climatic conditions of dry prairies, steppes and deserts. When, owing to the summer droughts, insects become scarce and are no longer sufficiently numerous to satisfy the needs of the ants, the granivorous species substitute the living but dried seeds of plants, but at least the species I have observed will not refuse any

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[1] The composition of these pasty masses suggests great similarity with the pellets found in the infrabuccal pockets of many ants. Part of Neger's "ant-bread-crumbs" may well have consisted of such infrabuccal pellets, which, after being regurgitated by the ants, were merely discarded outside the nest.

insects that may be obtainable. The seeds, however, have the very great advantage that they keep for a long time; they can be accumulated in granaries, thus providing abundant provisions, not exactly for the winter, as the ancient sages maintained, but in general for any periods of scarcity.

Ants and Epiphytes

Wherever in tropical and warm temperate regions the continued dampness of the air allows plants to thrive without being dependent on the soil for their water supply, epiphytes or air plants become an important and often very striking feature of the vegetation. They are especially abundant in the humid rain forest and are at their best in the mountain cloud forests of the tropics. The roots of these plants, boring into the many crevices on the tree's surface and retaining in their network decaying vegetable matter, rapidly loosen the outer layers of the bark and accumulate a cover of humus, affording favorable ecological conditions for a great variety of animals. Ants have not failed to recognize the nesting facilities here offered them by the many nooks and the uniform moisture and ventilation of this aërial root system. Indeed, the botanical collector in the tropics soon learns of the partiality of ants to the cover of humus on tree bark among and beneath the epiphytes.

Though the ethology of the various ants that live with epiphytes has been but little studied, there are a number of observations to show that the interrelations of these organisms are not always merely accidental but have in some cases produced reciprocal adaptation. The reader is referred to the Synopsis of Myrmecophytes (p. 494) for an account of the epiphytic *Myrmecodia*, *Hydnophytum*, and related rubiaceous genera which habitually harbor ants in the tubers of their rhizomes; similar pseudobulbs, inhabited by ants, are also known for a number of epiphytic ferns (p. 497.)

Ridley (1910, pp. 466–470), from observations in Singapore, has called attention to the fact that ants, mainly of the genus *Dolichoderus*, seem to be of considerable importance to the growth of certain epiphytic orchids. As soon as these plants start to grow, the ants bring up soil from the foot of the tree and fill the spaces between the roots, thus constructing shelters in which they raise their brood. This soil supplies nutritive substances to the roots and also keeps them cool and moist. From a comparison with young plants grown under different conditions, it would appear that the presence of ants among the roots is distinctly advantageous to the epiphyte, since seedlings not infested by ants are much weaker and suffer more from the drought. Though certain epiphytes, such as the orchid *Dendrobium crumenatum* Swartz and the ferns

Asplenium nidus Linnæus and *Platycerium biforme* Blume, are apparently more attractive than others to ants. Ridley does not mention that any of these plants in Singapore grow only on arboreal ant nests.[1] According to Ule, a number of species of Brazilian ants have acquired the habit of selecting seeds of certain epiphytes, which they carry up trees and shrubs into the crevices on the bark and into the axils of the branches, where they cover them with soil. As the plants grow their entangled roots produce sponge-like ant nests with epiphytic shoots growing out on all sides, the whole resembling "witch-brooms" or bird nests. In certain parts of the Amazonian Rain Forest these aërial agglomerations of plants are so abundant as to form one of the striking features of the scenery. (Ule, 1901, 1905*a*, 1905*d*, 1906*a*, and 1908, pp. 435–436.)

Ule has described two main types of these so-called "ant-gardens." The largest are made by *Camponotus femoratus* (Fabricius) and placed high in the trees of the inundated forest; they consist of the following plants: *Philodendron myrmecophilum* Engler, *Anthurium scolopendrinum* Kunth variety *Poiteauanum* Engler, *Streptocalyx angustifolius* Mez, *Æchnea spicata* Martius, *Peperomia nematostachya* Link, *Codonanthe Uleana* Fritsch, and *Phyllocactus phyllanthus* Link. The smaller gardens are more elegantly constructed and inhabited by species of *Azteca* (*A. traili* Emery, *A. ulei* Forel, and *A. olitrix* Forel); they are preferably placed in the lower trees and show the following flora: *Philodendron myrmecophilum* Engler, *Nidularium myrmecophilum* Engler, *Ficus paraënsis* Link, *Marckea formicarum* U. Dammer, *Ectozoma Ulei* U. Dammer, *Codonanthe formicarum* Fritsch, and two Gesneriaceæ. Ule claims that, with the exception of *Anthurium scolopendrinum* and *Phyllocactus phyllanthus*, these "ant epiphytes" are so intimately connected with the ants that they are not found in the Amazon Basin in any other station. If Ule's conclusion be true, we have here a most remarkable instance of "selection" practiced by ants. As pointed out by Massart (1906), the results in this case show a striking parallelism with the effects of cultivation by man of crops and vegetables. By persistently caring through countless generations for the cultivated plants, man has gradually deprived them of most of their means of defense in competition with other plants and against the hardships of environment. Crops and vegetables, when left to themselves, are no longer able to hold their own in the struggle with wild plants. Similarly, in the case of the plants domesticated by the ants in their "gardens," though it is certain that the seeds of these epiphytes are occasionally dropped elsewhere in the forest, they have lost the devices which allowed them to fight their rivals and are at present doomed unless cared for by the ants.

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[1] Hart (1895) in Trinidad has also noticed the necessity for the presence of ants in the epiphytic clusters of certain orchids in order to assure the healthy growth of these plants. J. Rodway (1911, pp. 132–133 and 139) mentions that, in British Guiana, many of the epiphytic orchids (especially of the genera *Coryanthes*, *Gongora*, and *Oncidium*) shelter large communities of ants in the oval mass of their fibrous roots, the ants filling up the interstices to make a waterproof nest, so that the collector finds it very difficult to dislodge the plant without being severely bitten.

The partiality of certain ants to the clusters of *Tillandsia* and other epiphytic bromeliads was first noted by Wheeler (1901*a*, pp. 526–528, and 1901*b*) in Mexico. He relates his experiences as follows:

> On accidentally pulling to pieces one of the large bud-like epiphytic tillandsias (probably *Tillandsia Benthamiana* Klotzsch), very common both in this and other localities about Cuernavaca, I was surprised to find it containing whole nests of ants, with their larvæ and pupæ snugly packed away like so many anchovies in the spaces between the moist overlapping leaves. A closer inspection showed that the ants had gnawed little holes through the leaves to serve as entrances to their chambers. These holes occasionally perforated a single leaf, but quite as often they threaded several leaves and extended to the very core of the bud. Sometimes a single colony of ants was divided up into companies, each occupying the space under a single leaf. But the most remarkable fact concerning these nests was the frequent occurrence of two or even three flourishing colonies belonging to different species in a single tillandsia, the whole habitable basal portion of which was rarely more than two to three inches long by one and one-half inches in diameter. Often these colonies were curiously intermingled in such a manner that there was no actual blending and the space under a single leaf was always occupied by ants of the same species, still, whole colonies or portions of a single colony were often completely surrounded by leaf spaces occupied by another colony.

Wheeler collected the following ants from these Mexican tillandsias: *Pseudomyrma gracilis* (Fabricius) variety *mexicana* Emery, *Crematogaster brevispinosa* (Mayr) variety *minutior* (Forel), *Leptothorax petiolatus* Forel, *Cryptocerus aztecus* Forel, *C. wheeleri* Forel, *Camponotus rectangularis* Emery variety *rubroniger* Forel, and *C. abdominalis* F. Smith variety. Though the tillandsias appear to suffer no injury from their tenants, Wheeler is not inclined to regard this association of plants and ants as a case of symbiosis, because at least four of the seven species enumerated above occur also under other conditions in the neighborhood of Cuernavaca.

Wasmann (1905*a*, p. 210, Pl. VIII, fig. 1) also describes and figures an interesting carton nest of *Crematogaster sulcata* (Mayr), from Rio Grande do Sul, Brazil, which was interwoven in a pensile cluster of epiphytic tillandsias. Calvert (1911), in Costa Rica, found the clumps of epiphytic bromeliads frequently inhabited by ants, especially by the large black species *Odontomachus hastatus* (Fabricius) "with enormously developed jaws, bent near the tip, which are carried wide open and measure one-quarter inch from tip to tip; occasionally they would be snapped shut with a very audible click."[1] A species of *Apterostigma*, one of the fungus-growing ants, was also found on one occasion by Calvert in a clump of Costa Rican bromeliads.[2]

A curious case of parabiosis between *Odontomachus affinis* Guérin subspecies *mayi* Mann and *Dolichoderus debilis* Emery variety *rufescens* Mann was observed by Mann (1912, pp. 36–41) in Matto Grosso, Brazil. These two species of ants were nesting together in an earthy structure built in the fork of the branches of a tree about 40 feet above the ground: "Fine roots of a plant ramified through this nest in all directions in such a manner as to make it quite firm, despite the nature of its component material." As noted by Wheeler, this nest was really an "ant-garden" of the type described by Ule.

Quite recently Wheeler (1921) has published much additional information with regard to similar "ant-gardens" or "flower-gardens" which he found common in the forest and jungle near the Tropical Research Laboratory of the New York Zoological Society at Kartabo, British Guiana. These gardens agreed very closely with Ule's description even in their floral make-up. Among the plants growing out of the spherical or elliptical lumps of black earth, which vary from the size of a walnut or orange to that of a foot-ball, two Gesneriaceæ (probably species of *Streptocalyx* and *Codonanthe*), an *Anthurium*, a *Peperomia*, and a few bromeliads were recognized. In British Guiana four different ants establish flourishing colonies in the gardens, namely, *Camponotus* (*Myrmothrix*) *femoratus* (Fabricius), *Crematogaster limata* F. Smith subspecies *parabiotica* Forel, *Anochetus* (*Stenomyrmex*) *emarginatus* (Fabricius), and one or more small, black species of *Azteca* very closely related to, if not the same as, the species taken by Ule in Brazil. The *Camponotus* and *Crematogaster* are by far the most frequent, occurring in fully 90 per cent of the gardens; the *Aztecæ* are rather sporadic and the *Anochetus* even less numerous. In more than 80 per cent of the gardens *Camponotus* and *Crematogaster* nest together in friendly parabiosis. The former, large and aggressive, and the latter, tiny and timid, mingle in the same long files that continually ascend and descend the trees, traverse the soil and explore the foliage. Their main occupation is to herd the jassids and membracids and collect the secretion of extrafloral nectaries. Examination of such "compound nests" revealed that all the superficial galleries, and they alone, are stuffed with *Crematogaster* and their brood, whereas only the center, or core, of the garden is occupied by the *Camponotus* with their larvæ and cocoons. The galleries of both species, however, open into one another so that the adult ants undoubtedly move about together more or less.

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[1] According to Mjöberg, another ponerine, *Myrmecia mjöbergi* Forel, of the dense Rain Forest of Queensland, builds its nest high on the trees in the clusters of epiphytic *Platycerium*. Its sting is much dreaded by the natives (Forel, 1915, Arkiv f. Zool., IX, No. 16, p. 7).

[2] Picado, in a recent paper on the fauna of Costa Rican bromeliads (1913, p. 273), evidently has misunderstood Calvert, for he writes: "Parmi les animaux broméliicoles mycophages, on peut citer quelques espèces de Fourmis du genre *Odontomachus*, dont la nourriture habituelle est constituée par des Champignons." *Odontomachus* is a ponerine ant not known to feed on fungi. Picado also speaks of finding several species of ants in epiphytic clusters of Bromeliaceæ (*op. cit.*, p. 348), but only mentions by name those indicated by Calvert.

The conclusions drawn by Wheeler from his observations differ in several important particulars from Ule's. The frequent parabiosis of *Crematogaster* and *Camponotus* shows that Ule's distinction of gardens on the basis of the size of the ants inhabiting them does not hold in British Guiana. Moreover, though the same plants do not occur in all gardens, no preference of certain ants for certain plants could be detected. All the species of ants found in the ant-garden biocœnose may also nest elsewhere, but it must be admitted that *Camponotus femoratus* shows a decided preference for the garden nest, so that we have here a very regular and intimate ethological relationship between an ant and certain epiphytes. According to Wheeler the ant-gardens are not started in the manner implied by Ule, viz., by means of the ants either putting seeds into crevices or accumulating a certain amount of humus at some spot on a tree or bush and then collecting and planting the seeds in the mass. It is more probable that the young ant epiphytes originally grow in small accumulations of earth or detritus, which are ultimately settled by colonies of the ants. That the amount of humus is gradually increased by the ants with the growth of the colony admits of no doubt, and it is possible that as the accumulation becomes greater, it may be sown with seeds falling from the original plant. Furthermore, it is practically certain, from what we know of the habits of ants, that new gardens cannot be seeded from old ones, as Ule maintains, for this would be too great a task for the single fecundated queens which start the new colonies. Ule's experiments with ants transporting the seeds of these epiphytes do not furnish conclusive proof that the insects actually sow the plants, for ants will often carry all sort of portable organic bodies into their nests, only to cast them out later when they find them useless. And lastly, Ule records no convincing observations in support of his contentions that the ants actually cultivate the growing plants. Wheeler believes, therefore, that it is advisable to suspend judgment for the time being as to the provenience and significance of the plant elements in the ant-garden biocœnose of tropical America.

The association of ants with certain species of *Dischidia*, a genus of epiphytic Asclepiadaceæ in the Oriental Region, has been treated in detail in a preceding chapter (p. 357) and other aspects of it are considered in the sequel (p. 520).

Gall-inhabiting Ants

The habit of sheltering their brood within old galls produced by various insects is very common with ants and is worthy of careful study for several reasons. In the first place, certain species of ants are so frequently found in galls that this location of their nests has become part of their normal behavior. Secondly, most galls have such regular shape and structure that often they look like normal productions of the plant; when settled by ants they may then simulate true myrmecodomatia and become a source of confusion in the study of myrmecophytism. Thirdly, the gall-inhabiting behavior of ants can help us to understand the origin and meaning of myrmecophily proper in plants. And, finally, as shown by Prof. Bailey's histological studies, certain myrmecodomatia occupy a somewhat intermediate position between normal plant structures and galls, since the intervention of the ants results in the production of hyperplasias or abnormal tissues by the plant.

Gall-inhabiting ants are rarely met with in the colder regions of the globe, where the rigor of winter prevents these insects from acquiring true arboreal or epiphytic nesting habits. Patton (1879), however, recorded finding in Connecticut, nests of *Leptothorax curvispinosus* Mayr (= *Stenamma gallarum* Patton), with queen, workers, and larvæ, in deserted, dead galls of *Gelechia gallæsolidaginis* Riley on the stems of goldenrod (*Solidago* species) and in those of *Cynips spongifica* Osten Sacken on oaks; and H. Ross (1909) has mentioned the frequent occurrence in southern Germany of *Crematogaster brevispinosa* Mayr variety *minutior* Forel in old oak-galls.

On the other hand, the gall-inhabiting behavior becomes part of the normal habits of many species of ants in the xerophytic and warmer parts of the southern Nearctic and Palearctic Regions. Wheeler (1904*a*, pp. 155–158; and 1910*b*, pp. 208–212) has written a most entertaining account of the ant-fauna of the spherical, woody galls produced by the cynipid *Holcaspis cinerosus* Bassett on the twigs of the Texan live oak. *Crematogaster lineolata* (Say) subspecies *læviuscula* Mayr and its variety *clara* Mayr merely use them as temporary shelters for the workers, but *Leptothorax obturator* Wheeler, *L. fortinodis* Mayr, *Camponotus caryæ* (Fitch) variety *decipiens* Emery and its subspecies *rasilis* Wheeler, and *Colobopsis abdita* Forel variety *etiolatus* Wheeler are able to bring their males and virgin females, as well as numerous workers, to maturity within the narrow confines of these galls. Nevertheless, all of these species may also be found nesting in dead wood. The *Colobopsis* is particularly interesting because of the peculiar shape of the head which, in the major workers, is truncated in front; with this flattened, anterior part, the soldiers block the entrance to the nest, stepping aside only at a tactile signal given by an incoming worker. In Sicily, De Stefani-Perez (1905) commonly found colonies of *Crematogaster scutellaris* (Olivier) and *Leptothorax tuberum* (Fabricius) inside old, deserted galls of *Cynips tozæ* Bosc; and others of *Leptothorax nylanderi* (Förster) in empty galls of *Cynips kollari* Hartig.

Having paid special attention to plant galls during my sojourn in the Belgian Congo, I frequently found ants nesting inside such deserted structures. While this was rather common in the drier, open Savannah country, I cannot at present recall a single instance of a gall-inhabiting ant in the Rain Forest. This is probably due to the fact that the great majority of galls in the moist, forested areas are produced by soft-tissued organs, such as leaves, flowers, and the like, which drop off and decay soon after being left by their makers. In the Savannah woody galls are much more frequent; these, when empty, remain for many months or even years on bush or tree, their solid walls enclosing ideal shelters for ant colonies.

The following are a few of the ants which I found nesting in deserted galls in Katanga, during the years 1911 and 1912.

Cataulacus luja Forel variety *gilviventris* Forel and *C. bequaerti* Forel were found at Kabanza, near Kikondja, nesting in empty lepidopterous galls on a tree.

Leptothorax innocens Forel had established regular formicaries, with larvæ and pupæ, inside an old gall of a tree at Elisabethville.

Crematogaster gallicola Forel and its various forms seem to be common gall-inhabiting ants throughout the range of the species. The typical form was originally found by Liengme at Delagoa Bay, "in einer Stengelgalle" (Forel, 1894, p. 95), and Arnold (1920, p. 533) found a colony of it, with queen and workers, in a gall at Somabula, Southern Rhodesia. The subspecies *latro* Forel was described from the Kalahari, where, according to L. Schultze, it lives "in gallenartigen Anschwellungen der Zweige einer Akazie mit Blattläusen." I collected the subspecies *spuria* Forel, with larvæ and pupæ, from old twig galls on *Monotes katangensis* É. De Wildeman at Elisabethville; while the variety *oraclum* Forel[1] was very common at Sankisia in a cecidium on the branches of *Dalbergia Bequaerti* É. De Wildeman.

To the foregoing could be added for Africa:

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[1] According to Arnold, this form should be named *Crematogaster bulawayensis* (Forel).

Tapinoma arnoldi Forel builds its small nests within hollow galls in Southern Rhodesia (Arnold, 1915, p. 155).

Cataulacus rugosus (Forel) was originally described from Delagoa Bay, where Liengme found it in empty caulinary galls (Forel, 1894, p. 78).

Crematogaster castanea subspecies *ferruginea* variety *durbanensis* (Forel) makes its nests in Southern Rhodesia "in hollows in trees, or in hollow branches, and more rarely in galls; elsewhere it has been recorded as making large carton nests, attached to the branches of trees and shrubs" (Arnold, 1920, p. 493).

Polyrhachis cubaënsis subspecies *gallicola* Forel was described from specimens found in galls at Delagoa (Forel, 1894, p. 71).

The coccid *Houardia troglodytes* Marchal was found in populous colonies, together with a species of *Crematogaster* (allied to *C. kneri*), occupying spacious cavities in the branches of *Balanites ægyptiaca* Delile in Senegambia. Since the branches had swellings corresponding to these cavities, it would seem that the ants had taken possession of empty galls, bringing the scale insects with them (P. Marchal, 1909*a*, p. 586; 1909*b*, pp. 171–173).

At Leopoldville, in May 1915, I was much puzzled over certain swellings inhabited by *Crematogaster depressa* (Latreille) variety *fuscipennis* Emery on the branches of a small rubiaceous shrub, and for some time I was in doubt as to whether they were true myrmecodomatia. Subsequent examination of some of these swellings on younger branches showed that they were galls produced by a caterpillar. I have already pointed out that it is by no means always easy to distinguish between insect galls and myrmecodomatia, and the origin of ant-inhabited swellings or pouches of unknown plants should therefore be studied with the utmost care. Galls have, in fact, been described as myrmecodomatia and the plants on which they were found erroneously regarded as myrmecophytes. The two following examples are taken from the African flora; but a similar confusion has been made elsewhere, too, as, for instance, in the case of the Indian *Ficus inæqualis* described and figured by Schimper as a myrmecophyte (Ridley, 1910, p. 458). It is possible that similar errors have found their way into the general synopsis of myrmecophytes given in the sequel.

Clerodendron formicarum Guerke[1] (= *C. Lujæ* É. De Wildeman and Th. Durand) is not, as its name would imply, a myrmecophilous plant. It is found rather commonly in the open grass-country north and south of the Congo forest: in the Lower Congo, Kasai, Katanga, and northeastern Uele. I frequently observed it in Katanga (1911) and found that practically all specimens show one or more spheroidal or pear-shaped swellings, 7 to 15 mm. in diameter, on the stem, the petiole, or the flower stalk. Often the swelling is symmetrically developed, especially when occurring on a petiole, but in many cases it bulges more on one side of the support. Two galls may be placed close, one above the other, or even partly united. A cross-section of a young swelling shows the typical structure of a pith gall: a spacious central cavity, completely closed and surrounded by the hypertrophied fibrovascular tissues of the stem. In young galls I always found a single larva of a lace-bug belonging to the genus *Copium* (Tingitidæ) feeding inside the cavity on the pith cells along the wall. When the *Copium* reaches the adult stage, the "ripe" gall splits open, allowing the bug to escape. Such old, empty galls may eventually be invaded by ants, but I have never observed this myself. I am, therefore, fully satisfied that the swellings of *Clerodendron formicarum* are true insect galls. That they are not real myrmecodomatia is moreover indicated by their irregular distribution over various parts of the plant.[1]

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[1] Described in Engler's Bot. Jahrb., XVIII, 1894, p. 179. A good illustration is given by Thonner, 1908, 'Die Blütenpflanzen Afrikas,' Pl. CXXXIV; fig. C of this plate represents the galls as 'Blätter mit von Ameisen bewohnten Anschwellungen.'

We now come to a consideration of the so-called myrmecophilous acacias of Tropical Africa. These plants present a rather difficult problem, and, though I myself am convinced that they are not true myrmecophytes, the facts in the case are still far from being satisfactorily elucidated. Unfortunately, I have never had an opportunity to study them in the field.

While travelling across the deserts of Nubia and Sennaar in 1867, G. Schweinfurth discovered a curious, shrubby *Acacia*, which he described and figured under the name *Acacia fistula* (1867, p. 344, Pls. IX and XIII). Some of the thorns of this plant were considerably swollen, hollowed out, and pierced by an orifice; the wind playing on these empty swellings produced a whistling noise, the plant being therefore called "Ssoffar," or flute, by the natives. Schweinfurth did not record the occurrence of ants in the swellings[2] but stated that the small, circular orifice was pierced "by the escaping insect," the swellings being, in his opinion, true insect galls, a view endorsed by Ascherson (1878, p. 44).

Many travellers have since remarked upon the abnormally swollen thorns of certain East African acacias and have also called attention to the fact that they are frequently settled by ants. According to Harms' recent account[3] the following African species of the genus *Acacia* have been found with ant-inhabited swellings:

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[1] Various species of *Copium* produce galls on several Central African *Clerodendrons*; they most frequently affect the flowers. *Copium stolidum* Horvath, for instance, very commonly deforms the flowers of *Clerodendron spinescens* Guerke.

[2] Keller (1892 a, p. 137), however, asserts that Schweinfurth found ants inside the swollen thorns of this *Acacia fistula*, though he did not mention the fact in his paper.

[3] In Engler, 1915, 'Die Pflanzenwelt Afrikas,' III, 1, pp. 368–373; see also Harms, 1914, Engler's Bot. Jahrb., LI, pp. 361–365.

Acacia fistula Schweinfurth and *A. zanzibarica* (Sp. Moore). In Harms' opinion these two forms are hardly specifically distinct from the common African *A. seyal* Delile.

A. drepanolobium Harms.

A. formicarum Harms. This is probably Sjöstedt's "Flötenakazie" from the Masai-steppe.

A. pseudofistula Harms.

A. malacocephala Harms.

A. Bussei Harms.

The exact nature of the swollen thorns of these plants has been somewhat disputed. As mentioned before, Schweinfurth and Ascherson regarded them as true galls. This opinion is further supported by the thorough researches of Keller (1892a) and Sjöstedt (1908), as well as by the more recent observations of Glover Allen (Wheeler, 1913, p. 130, footnote), H. Winkler (1912, p. 65), and H. Schenck (1914, p. 453). Sjöstedt was unable to discover the maker of the galls; yet he believes that they may owe their development to the sting of some dipterous or hymenopterous insect. Glover Allen, however, found that the enlarged thorns of *Acacia fistula* (from the Nilotic Sudan) consist, when young, "of a solid mass of green, succulent tissue, with a single small larva inside, as in a typical insect gall"; and H. Winkler discovered in German East Africa a beetle-larva in a swollen *Acacia* thorn that was entirely intact. Alluaud and Jeannel are, it seems, the only observers inclined to believe that the ants themselves produce the galls,[1] but their own observations hardly support this view.

During his travels in British East Africa with R. Tjäder, in 1906, Mr. H. Lang made some observations on gall-bearing acacias growing in large numbers on the Athi Plains. One of his photographs of these curious plant deformations is reproduced on Plate XXVI, fig. 2. From information he kindly gave me, I am led to agree with Sjöstedt and others that the swellings are true insect galls.[2] They are not found on all specimens of the same species of *Acacia*, even in one locality; while on some plants practically all the thorns are swollen, others nearby bear hardly any galls; furthermore, their size is quite variable and their shape rather irregular. Mention may still be made of the fact that, while the species of *Acacia* enumerated above have a rather wide distribution in eastern Central Africa, swollen thorns have been noted in only a few localities within their range.

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[1] "En somme, nous ne pouvons pas affirmer avec certitude quels sont les rapports exacts du *Crematogaster* [illegible] avec l'*Acacia* sur lequel on le trouve, mais ce que nous avons vu nous pousse fortement à croire que ce sont bien les *Crematogaster* qui provoquent par leur intervention à l'extrémité des rameaux jeunes, la formation des galles, qui entretiennent leur accroissement, puis le moment venu les perforent pour y installer leur nid" (Santschi, 1914, p. 98).

[2] Some authors admit that the swellings of the thorns of African acacias are not due to ants, yet call them ant-galls ("Ameisengallen"). This misleading term should be avoided, because it conveys the erroneous idea that the ants are responsible for the production of the galls. Even the myrmecodomatia of true myrmecophytes are normally produced by the plant without the intervention of ants, though, when inhabited by these insects, some tissues in certain species may show a peculiar hyperplasia.

The conclusion thus seems plainly justified that these East African acacias should be excluded from the list of true myrmecophytes. Sjöstedt still clings to the idea of a mutualistic symbiosis between these plants and the ants which often settle their hypertrophied thorns. In case the swellings are typical insect galls, I do not see how this view can be supported by facts. The excellent nesting sites offered by old acacia galls are merely exploited by the ants, and it is doubtful whether the plant derives any benefit from the presence of these insects; certainly, the galls must be considered as pathological productions, which could hardly be of utility to the economy of the plant. Moreover, as pointed out by Wheeler, it is by no means clear that the acacias are not sufficiently protected by their long, sharp thorns from browsing animals.[1]

The following ants have been found inside thorn galls of African acacias:

Crematogaster brunneipennis subspecies *acacia* (Forel), in thorn galls of *Acacia fistula*, Abyssinia (Keller, 1892a).

Crematogaster chiarinii Emery, in thorn galls of *Acacia zanzibarica*, near Kahe, in the plain at the foot of Mt. Kilimanjaro (Sjöstedt, 1908); and its variety *cincta* Emery, in swollen thorns of *Acacia fistula*, Somaliland (Keller, 1892a), together with *Paussus spinicola* Wasmann (Wasmann, 1892 and 1915).

Crematogaster gerstaeckeri (Dalla Torre) (= *C. cephalotes* Gerstaecker), in a thorn gall of *Acacia* near Mombasa (Gerstæcker, 1871, p. 356).

Crematogaster ruspolii Forel, in thorn galls of *Acacia fistula*, Abyssinia (Keller 1892a).

Crematogaster sjostedti (Mayr), in thorn galls of *Acacia drepanolobium*, near Kahe, in the plain at the foot of Mt. Kilimanjaro, and in West Usambara (Sjöstedt, 1908).

Crematogaster nigriceps subspecies *prelli* (Forel), taken by Prell from thorns of "*Acacia cornigera*" in the plain of Kahe, German East Africa.

Crematogaster castanea F. Smith (= *C. tricolor* Gerstaecker), in thorn galls of an unidentified *Acacia* of the Masai steppe, probably *A. formicarum* (Sjöstedt, 1908).

Crematogaster rivai Emery, described from swollen spines of *Acacia larin*, Abyssinia (Emery, 1897, p. 600).

Crematogaster nigriceps Emery was found by Ruspoli in swollen spines of *Acacia larin* in Somaliland (Emery, 1897, p. 601).

Crematogaster mimosa (Santschi) was found by C. Alluaud in thorn galls of *Acacia stenocarpa* on Mt. Kenia at about 2000 m. (Santschi, 1914, p. 89).

Crematogaster vulcania (Santschi) was collected by Alluaud and Jeannel from swollen thorns of an acacia (*Acacia stenocarpa*?) in the steppe of the Rift Valley, at the foot of Mt. Longonot (Santschi, 1914, pp. 96–98).

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[1] The Central and South American bull-horn acacias are true myrmecophytes. A résumé of the observations made on these remarkable plants is given in the synopsis of myrmecophytes (pp. 510).

Crematogaster (*Decacrema*) *solenopsides* subspecies *flavida* (Mayr), in thorn galls of *Acacia Bussei*, Usambara (Sjöstedt, 1908); the variety *gallarum* (Santschi) was taken in galls of an acacia at Mindouli, French Congo.

Cataulacus intrudens (F. Smith), in thorn galls of *Acacia Bussei*, Usambara (Sjostedt, 1908); originally described from thorns of *Acacia*, in Natal

Tetraponera penzigi (Mayr), in thorn galls of *Acacia drepanolobium*, near Kahe, in the plain at the foot of Mt. Kilimanjaro, and in West Usambara (Sjöstedt, 1908).

Tetraponera natalensis F. Smith was taken from thorns of a species of *Acacia* in Natal (F. Smith, 1876).

According to Kohl (1909, p. 151), H. Schinz found ants inside hypertrophied thorns of *Acacia horrida* in South Africa.

As would be expected from the fortuitous production of galls on plants, none of the ants mentioned in the preceding pages seems to restrict the location of its nest to galls. They are evidently all arboreal species which are in the habit of sheltering their brood in hollow branches or cavities of trees.

Fungus-growing Ants

Allusion has been made above to the depredations of the South American leaf-cutting, or parasol, ants. Though the destruction wrought by these insects was familiar to the indigenes and early colonists, what use is made of the vegetable matter carried into their nests is a discovery of comparatively recent date. H. W. Bates in his classical 'Naturalist on the Amazon' (1863, I, pp. 23–26) describes the activities and earthworks of the large South American leaf-cutter, *Atta cephalotes* (Linnæus), in great detail. In his opinion, "the leaves are used to thatch the domes which cover the entrances to their subterranean dwellings, thereby protecting from the deluging rains the young broods in the nest beneath." Lincecum (1867), Norton (1868), and B. R. Townsend (1870), who studied the smaller Mexican and Texan parasol ants, all overlooked the most important peculiarity in the behavior of these insects.

Belt (1874) was the first to understand the true significance of the leaf-gathering habit. He definitely states that the parasol ants use the leaves "as a manure, on which grows a minute species of fungus, on which they feed;—that they are, in reality, mushroom growers and eaters." He then proceeds to describe the interior of the nests of the species of *Atta* studied by him in Nicaragua.

> The chambers were always about three parts filled with a speckled, brown, flocculent, spongy-looking mass of a light and loosely connected substance. Throughout these masses were numerous ants belonging to the smallest division of the workers, which do not engage in leaf-carrying. Along with them were pupæ and larvæ, not gathered together, but dispersed, apparently irregularly, throughout the flocculent

> mass. This mass, which I have called the ant-food, proved, on examination, to be composed of minutely subdivided pieces of leaves, withered to a brown color, and overgrown and lightly connected by a minute white fungus that ramified in every direction throughout it. I not only found this fungus in every chamber I opened, but also in the chambers of the nest of a distinct species that generally comes out only in the night-times. . . . When a nest is disturbed, and the masses of ant-food are spread about, the ants show great concern to carry away every morsel of it under shelter again.

Belt's observations were subsequently confirmed by Fritz Müller (1874), Tanner (1892), A. Möller (1893), Sampaio (1894), H. v. Ihering (1894 and 1898), Urich (1895*a-b*), Swingle (1896), Forel (1896*a-c*, 1897), Wheeler (1901*b*, 1905*b-c*, 1907, 1910*b*, etc.), Gœldi (1905*a-b*), J. Huber (1905, 1907, 1908), and others. It is now an established fact that the Attini, a tribe of myrmicine ants restricted to America, are all intimately associated with fungi, which they cultivate on an appropriate substratum and which in turn supply these insects with their only food.[1] They are the only ants known to be strictly vegetarian. Various stages in the development of the fungus-growing behavior may still be recognized among the many forms of the tribe.[2] The different members of the lower genus, *Cyphomyrmex*, and probably also of *Myrmicocrypta*, make a small, crude nest; they collect caterpillar excrement on which they grow a flocculent mycelium with well-developed food-bodies, or bromatia (called "kohlrabi-heads" by A. Möller); their gardens are only a few centimeters in diameter, of irregular shape, and lie on the floors of small dilations in the rough earthen galleries of the nest. *Apterostigma*, *Sericomyrmex*, *Mycetosoritis*, and *Trachymyrmex* all excavate more regular nests and construct pendent mushroom gardens on a substratum of insect excrement and vegetable débris. The gardens of *Apterostigma* are sometimes provided with a special mycelial envelop, but those of all other Attini are naked. *Mœllerius* and *Acromyrmex* make one or more large gardens on the floors of the nest-chamber. And, finally, the *Attæ*, *s. str.*, which include the true parasol ants, the largest and most powerful species of the tribe, collect large quantities of leaves, flowers, and other vegetable substances for their gardens; their nests attain huge dimensions and comprise a number of large chambers, each with a sessile mushroom garden of triturated plant fragments, permeated with fungus hyphæ.

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[1] The genus *Proatta*, recently discovered by v. Buttel-Reepen in Sumatra, was originally placed by Forel among the Attini, but later separated by the same author to form a tribe of its own. There is nothing to show that this Sumatran ant has developed fungus-growing habits.

[2] The habits of the genus *Blepharidatta* Wheeler are unknown.

The origin of new colonies among the Attini and the method of transferring fungus culture from the maternal to the daughter colony have been investigated by H. v. Ihering (1898), Gœldi (1905*a*), and J. Huber (1905, 1907, and 1908). The deälated, fertilized female of *Atta sexdens* (Linnæus) often starts a new colony alone; she digs a burrow in the soil and forms at a depth of 20 to 30 cm. a chamber in which she deposits within a few days a little packet of eggs. Even at that time one finds beside the eggs a flat heap of loose white substance, only 1 to 2 mm. in diameter, which is the earliest rudiment of the fungus garden. On searching for the origin of the fungus germs with which this new garden is established, v. Ihering discovered that every *Atta* queen, on leaving the parental nest, carries in her intrabuccal pocket a loose pellet of débris containing also hyphæ from the fungus gardens. This fact was confirmed by J. Huber, who successfully reared an *Atta* colony from its inception to the appearance of the first workers. The day following the nuptial flight the female disgorges this pellet on the floor of the newly dug chamber; to keep the fungus alive she frequently manures parts of it with liquid excrement from the tip of her gaster. In this early stage of the colony the queen does not feed on the fungus but eats a great number of her own eggs. The first larvæ, too, are fed directly on eggs thrust into their mouths by their mother. Shortly after hatching, the first workers usurp the functions of the mother ant, which henceforth degenerates into an egg-laying machine. They manure the garden with fecal droplets and feed the larvæ with their mother's eggs, while they themselves feed on the bromatia meanwhile developed on the hyphæ. A few days later the workers start to extend the formicary; they also break through the surface of the soil and return with new material for the fungus garden. In the meantime, the bromatia have become so abundant that they can be fed to the larvæ. Huber also observed that the founding of a new colony by a queen is often unnecessary, because fertile females of *Atta sexdens* are readily adopted by strange workers of their own species, thus adding to the strength of existing formicaries.

The systematic position of the fungi grown by the Attini is still disputed. A. Möller is apparently the only botanist to have made a special point of studying this problem. His attempts, however, to raise any fruiting form from mycelial cultures started with portions of the fungus gardens of ants were unsuccessful. But he found in four instances an agaricine mushroom, which he called *Rozites gongylophora*, growing on extinct or abandoned *Acromyrmex* nests. From the basidiospores of this plant he succeeded in raising a mycelium resembling in all respects that of the ant-gardens. Three of the species of *Acromyrmex* did not hesitate to eat portions of this mycelium and also of the pileus and stem of the *Rozites*. Möller therefore identified the fungus grown by *Acromyrmex* with his *Rozites gongylophora* and in this he has been followed by most other investigators. Wheeler (1910*b*, pp. 327-328), however, maintains that Möller's observations are far from conclusive. He believes that the fungi cultivated by the ants may be more closely related to the moulds (Ascomycetes) than to the toadstools (Basidiomycetes). He has even described the peculiar fungus grown by the Texan *Cyphomyrmex rimosus* (Spinola) variety *comalensis* Wheeler as *Tyridiomyces formicarum*, assigning it provisionally to the Exoascaceæ (Wheeler, 1907, p. 772).[1]

There can be little doubt that the highly specialized fungus-growing behavior of the Attini must have been gradually derived from some more primitive fungus-eating habit. How this developed is at present a matter of conjecture, but it may be expected that other ants will show vestigial fungicolous habits. When these have been properly studied, they may, taken in addition with what is known of the ethology of other fungus-growing insects, give us a proper clue to the possible evolution of the complicated ethology of the Attini.

A condition very near the primitive fungus-growing behavior is perhaps exemplified in the remarkable carton nests of the European *Lasius fuliginosus* (Latreille). I quote the following description from Donisthorpe's recent volume on 'British Ants' (1915, p. 193):[2]

> These nests are often very large, having the appearance of a huge sponge, and consist of a number of irregular cells separated from each other by thin carton walls, which are rather brittle and generally black in color, but sometimes light brown, according to the amount and the color of the earth used in their construction. The carton contains a quantity of a fungus which was named *Septosporium myrmecophilum* by Fresenius (1852, p. 49, Pl. VI, figs. 29-31). Saccardo (1886, p. 538) describes it as *Macrosporium myrmecophilum* but considered it might be identical with *Cladotrichum*, and Lagerheim (1900) came to the conclusion that it was really a *Cladotrichum*, and called it *C. myrmecophilum*. I supplied Dr. Jessie Baylis Elliot of the Birmingham

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[1] Spegazzini has also given descriptions of fungi taken from the gardens of various Attini in Argentina. He regards *Bergellinia ? belti* Spegazzini (1899, p. 311) as one of the Discomycetes. *Rhizomorpha formicarum* Spegazzini (1899, p. 352) is probably the sterile form of one of the Xylariaceæ. Both these fungi were found in the mushroom gardens of *Acromyrmex lundii* (Guérin). *Monilia formicarum* Spegazzini (1910, p. 414), described from the nests of *Atta hystrix*, is one of the many imperfect fungi of unknown affinities. Prof. Wheeler has kindly sent to me for publication the following extract from a letter written by Mr. Carlos Bruch, dated La Plata, Argentina, July 16, 1921: "You will, no doubt, be interested in the discovery of the mushrooms which are cultivated by some of the Argentinian Attini. *Acromyrmex lundii* cultivates *Xylaria micrura* Spegazzini; *A.* (*Moellerius*) *heyeri*, *Poroniopsis bruchi* Spegazzini, and *Atta vollenweideri* a gigantic agaricus, *Locelina mazzuchii* Spegazzini. This year I found on the culture substratum that had been carried out into their hills by the ants hundreds of *Poroniopsis* in every nest. Masses of substratum which I had sifted for guests two months previously were completely covered by the mushrooms. The damp autumn months this year were particularly favorable to the development of the mushrooms mentioned." *Xylaria* and *Poroniopsis* are both Pyrenomycetineæ (Ascomycetes) of the family Xylariaceæ. *Locelina* is one of the Hymenomycetineæ (Basidiomycetes) and placed in the family Agaricaceæ. *Rozites* is also a genus of the Hymenomycetineæ.

[2] I have inserted in parenthesis the dates and pages of the references.

> University with various samples of *D. fuliginosa* carton, and she has proved, by making cultures, etc., that the fungus it contains is a *Cladosporium*, and so should be called *Cladosporium myrmecophilum* (J. B. Elliot, 1915, p. 138, Pl. VIII, figs. 1–4). The "raison d'être" of this fungus is probably twofold; the hyphæ may act as food for the ants and their brood—it forms a delicate bluish mould on the walls of the cells and under the microscope it may be seen to have been bitten off by the ants—and the mycelium helps to strengthen the walls of the nest. The ants most probably cultivate this fungus intentionally, as no other species of fungus is found in these nests, but it would not alone supply sufficient food for the teeming myriads that form the population of a large colony.

No definite proof has apparently been given that the fungus in the carton nest of *Lasius fuliginosus* contributes to the diet of the ants, but Donisthorpe remarks that "the great difficulty experienced in rearing *fuliginosa* larvæ in captivity—when no carton is present—would seem to show that the fungus is necessary as food, though the ants feed on other substances as well." Adlerz (1913, p. 63) and Donisthorpe (1915, p. 229) have shown that *Lasius umbratus* (Nylander) also builds carton nests with inner walls covered by the hyphæ of a fungus. Dr. J. B. Elliot (1915, pp. 139 and 142, Pl. II, figs. 5–10) described the hyphæ found in one of these nests in England as a variety *myrmecophilum* of *Hormiscium pithyophilum* (Wallrich), a fungus which is usually found in thick, superficial patches of mycelium on the leaves of pines, firs, and yews.[1]

According to Dr. J. B. Elliott (1915, p. 142), the species of fungus associated with the carton of *Lasius fuliginosus* is always the same, which also holds true in the case of *L. umbratus*. "Since the fungus exists in the carton as a pure culture, all 'foreign' fungi are doubtless 'weeded' out, as in the fungus gardens of the white ants and the leaf-cutting ants, for many varieties of fungus spores must be introduced into the nests by the passing of insects in and out."

It seems likely that certain, at least, of the many tropical ants which construct nests either of carton or of more loosely agglutinated plant-fibres, will eventually show similar associations with fungi. Farquharson (1914), in Southern Nigeria, several times found fungous hyphæ growing on the aërial shelters composed of chewed wood and built over coccids by a species of *Crematogaster*. But it is very doubtful whether the ants had anything to do with this fungus. Perkins suggested that the mycelium in this case may merely have grown on the excreta of the coccids or even on the scale insects themselves. The roughly woven nests of the African *Macromischoides aculeatus* (Mayr) are frequent on leaves in the forest. They have been described by Santschi as lined with a mycelium bearing fructifications. Prof. Wheeler's examination of nests of this species (p. 190) argues for the probability that this fungus has no relation with the ants, being but one of the many fungi which in the moist tropical forest grow over dead vegetable matter. *Chromosporium formicarum* Ferdinandsen and Winge (1908, p. 21, Pl. II, fig. 11) is another imperfect fungus found by Raunkiær on the island of St. John, West Indies. Its brown-yellow conidia covered the walls of galleries in a decaying log occupied by unidentified ants. The writers assume that the ants feed on these conidia, but this will need actual confirmation.

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[1] These fungi from the nests of *Lasius fuliginosus* and *L. umbratus* are all conidia-bearing or sterile mycelia of uncertain systematic position.

A few words may be said about the peculiar fungi found growing on the inner walls of the myrmecodomatia of certain ant-plants. Miehe (1911*b*, pp. 331-341) made the interesting discovery that some of the galleries in the pseudobulbs of the Javanese *Myrmecodia tuberosa* and *Hydnophytum montanum* are lined with mycelium. This is found only in tubers inhabited by ants; the free tips of the hyphæ are evidently bitten off by these insects and in some places the sods of mycelium are trimmed to an equal level. Miehe believes that the fungus grows on the excrement of the ants, but he evidently discards the idea that the insects feed on it. If they cut the hyphæ down, it is merely, he thinks, because too thick a carpet would soon obstruct the galleries of the formicary. He thus regards the fungus as a mere intruder of no use to the ants. The presence of fungi inside myrmecodomatia seems to be very general, since Prof. Bailey found a more or less luxuriant growth inside the cavities of all the myrmecophytes of which he could obtain suitable material (See Part V). The mycelia are sporadically distributed in most cases, but their aërial portions show unmistakable evidences of having been cropped by the ants. In one of the species of *Plectronia* (*P. Laurentii*) and in the *Cuvieræ* there are dense mats of delicate, white hyphæ, which remind one forcibly of the "ambrosia" cultivated by certain wood-boring beetles and gall-midges, of which I shall have more to say below. In a recent paper, Bailey (1920) fully discusses the question whether the mycelia of the myrmecophytes are eaten by the ants and whether they are cultivated by them or are merely adventitious.

The pellets in the infrabuccal pockets of ants inhabiting myrmecophytes usually contain numerous spores and also fragments of hyphæ which appear to have been removed from the walls of the domatia. This might be considered as indicating that the ants feed to a greater or less extent upon the fungi. But the evidence appears much less conclusive when viewed in the light of Bailey's discovery that the infrabuccal pellets of almost all ants tend to contain spores and fragments of hyphæ. This is as true of the entomophagous Ponerinæ and Pseudomyrminæ as of the more or less omnivorous Myrmicinæ, Dolichoderinæ, and Formicinæ; of ants of temperate as of tropical regions; and of species which nest in the ground or in carton or silk domatia as of those which live in decaying plant tissue. On the other hand, such is not the case with the crops and stomachs of imaginal ants. If any of the ants actually feed upon fungi, they must triturate the spores and mycelia, or compress them, and drain off the liquid or semi-liquid contents. Under such circumstances, one would expect to find torn or ruptured spores and finely divided fragments of hyphæ in the infrabuccal cavity. This was not so, however, in any of the pellets analyzed by Bailey; the spores and fungus filaments were intact and still retained their protoplasmic contents. All the evidence at hand favors Janet's (1896, p. 15; 1899) contention that the function of the infrabuccal pocket is to serve as a receptacle for food-residues and detritus. Bailey therefore concludes that, though many ants are closely associated with fungi, there is no sufficient proof that any of the Formicidæ, other than the Attini, are fungivorous. The cropping of the hyphæ which cover the inner walls of myrmecophytes does not indicate necessarily that these fungi are eaten by ants.

In most myrmecodomatia the growth and sporadic distribution of the hyphæ suggest that the mycelia are purely adventitious. Only in the case of the localized luxuriant growths of "ambrosia" in *Cuviera* and *Plectronia Laurentii* are there indications that the ants may actually be fungus-farmers; the mycelia appear to be more or less pure cultures and are closely associated with the detritus of the ant colonies. Yet it is by no means certain that even these results are not obtained quite unintentionally on the part of the ants. The environmental conditions within the myrmecophytes undoubtedly facilitate the growth of fungi which must be kept within bounds by a constant cropping of the mycelia or they might interfere with the activities of the insects. Unless all fungi are equally resistant to continued cropping and react similarly in the peculiar conditions within the domatia, certain species will tend to become dominant. Should a particular form gain the upper hand and grow actively, it would probably be transferred to new nests by the queens, since the infrabuccal pockets of imagines almost invariably contain fragments of hyphæ or spores. Thus "pure cultures" of fungi may have been brought about through the activities of the ants, but quite incidentally and without utilitarian purpose on the part of the insects. Such considerations are certainly of great interest in a discussion of the probable origin of the remarkable fungus-growing and fungus-feeding habits of the highly specialized Attini. If mats of hyphæ growing in particular luxuriance on the detritus (pellets, feces, etc.) of the colony were found by the ants to be edible, it would be a comparatively simple matter for these insects to increase the volume of their primitive fungus gardens by adding extraneous material, such as insect excrement or vegetable débris, to the original compost.

The systematic affinities of the fungi found flourishing on the inner walls of myrmecophytes have not been investigated. They probably represent imperfect forms of some of the higher Ascomycetes.

It is interesting to compare the fungus-growing behavior of the Formicidæ with like activities of other insects. Such are known at present to exist among the termites, or Isoptera, certain wood-boring beetles of the families Scolytidæ and Lymexylonidæ, and a number of gall-making Cecidomyidæ.

That certain termites cultivate mushrooms in their nests was known long before similar observations were made with regard to ants, fungus gardens of the former having been accurately described in 1781 by Smeathman in his celebrated 'Account of the Termites.' Yet the true meaning of these gardens was not realized till after the fungicolous Formicidæ had been more fully investigated. Even at present, many aspects in the behavior of fungus-growing termites, such as the manner in which they feed on the mushroom and the origin of fungus gardens in their new nests, are still obscure. So much is certain — that their fungus-growing behavior differs from that of the Attini in several important particulars as summarized by Wheeler (1907, pp. 784–785).

> In the first place the termites use their own excrement as a substratum, moulding it into the form of a sponge containing numerous habitable chambers and galleries. This substance is, of course, much harder and more compact than the comminuted leaves, etc., employed by the Attini. Second, the fungus grown on this substratum forms bromatia (the spherules or oïdial heads) of a very different type from those found in the gardens of the Attini. And third, the termites that are in the habit of growing fungi are not exclusively mycetophagous like the Attini, but subsist also and probably very largely on dead wood, twigs and leaves.

According to Bugnion (1914*a*, p. 171), the larvæ and the royal pair alone are nursed with the bromatia of the fungus, while the adult workers and soldiers feed directly on vegetable fibres and cells. It may further be mentioned that the fungus-growing habit is by no means general in the order Isoptera, but is restricted to certain paleotropical genera, such as *Microtermes* Wasmann and *Termes* Linnæus, which are regarded as the most specialized members of the group. As in the case of the fungus gardens of the Attini, the identity of the fungi grown by the termites is far from being known beyond question. The fungous sponges found in the termitaria are evidently imperfect forms of higher mushrooms, which have been ascribed to certain Basidiomycetes (Agaricaceæ) by Holtermann (1899), Doflein (1905*b*), and Petch (1906).

The so-called "ambrosia beetles" are all wood-boring Coleoptera whose larvæ do not feed directly on the fibres of the wood but on the bromatia of a fungus which the adults cultivate on the walls of their galleries. The best-known of these are certain Scolytidæ, which furthermore resemble ants and termites and differ from most other Coleoptera in that the adult beetles live in societies and care for and feed their larvæ. Perhaps the most interesting points in this case are that, so far as known, the food of each species of fungus-growing scolytid is limited to a certain kind of ambrosia and only the most closely related species have the same food fungus; also that the origin and further growth of the fungus is entirely under the control of the beetle. When the mother beetle leaves the old burrow to excavate new brood galleries, wherein to deposit her eggs, she transports with her the germs of the ambrosia fungus. Strohmeyer (1911) discovered lumps of mycelium adhering to the dense brushes of hair found on the head of the females of certain exotic Scolytidæ, these brushes being totally absent in the males; he believes that the fungus is transferred in this manner to the new burrows. In other ambrosia Scolytidæ, however, the females show none of these hair brushes, so that the fungus must be carried in some other way. According to Neger (1908*a-d*) the conidia of certain of these mushrooms form a mucilaginous mass which adheres readily to any part of an insect passing over it. In some cases part of the bromatia is preserved in the digestive tract of the adult beetle, and voided in the new burrow (Schneider-Orelli, 1913). The ethology of another wood-boring beetle, the European *Hylecœtus dermestoides* (Linnæus), one of the Lymexylonidæ, has been studied by Neger (1908*a-d*, 1909*b*, and 1914) and more in detail by Germer (1912). These investigators have found that the larva, which burrows in dead tree stumps, never feeds on the wood itself. The walls of its galleries are overgrown with a mycelium producing globular bromatia and thick-walled spores, which are cropped off by the larva together with some of the hyphæ. Since the female of *Hylecœtus* lays her eggs on the bark of stumps and dies shortly after oviposition, it is rather difficult to understand how the fungus in this case enters the larval burrows.

The ambrosia fungi of beetles are evidently very different from the mushrooms cultivated by ants and termites. According to Neger (1909*b*, 1914) and Beauverie (1910*a-b*), they belong to the Ascomycetes; the former has described the mushroom from the galleries of *Hylecœtus* as *Endomyces hylecœti* and it is possible that the ambrosia fungi of the Scolytidæ are also related to the same genus.

The discovery that ambrosia fungi, similar to those cultivated by wood-boring beetles, grow inside the galls produced by certain gall-midges (Itonididæ, formerly called Cecidomyidæ), was made by Baccarini (1893). He found that the galls formed by *Asphondylia spinosa* Rübsaamen on the flower buds of *Capparis spinosa* Linnæus always contain a mycelium. A few mycozoocecidia—as Beccarini proposed calling them—have since been recorded in Europe, all being produced by species of the genus *Asphondylia*. Neger (1908*d*, 1909*a*, 1910*b*, and 1911*a*), who made extensive studies of these galls, found that the infections are by no means accidental, nor due to a parasitic or saprophytic fungus, and that the larvæ of the gall-midge feed on the mycelium. The spores are probably deposited on the plant by the female *Asphondylia*, together with the egg. Neger also recognized the great similarity between the fungi found in these galls and the "ambrosia" cultivated by certain Scolytidæ. He therefore proposed the term "ambrosia-galls" for all cecidia normally containing hyphæ of mushrooms. In a number of cases artificial cultures could be obtained from these fungi, which, it was thus shown, belong to species of *Macrophoma* (Ascomycetes) not yet found outside the galls.

Many of the foregoing details have been taken from Wheeler's 'Fungus-growing Ants of North America' (1907), which gives a complete review of the fungus-growing behavior not only of ants but also of termites and ambrosia beetles. The reader is referred to this important paper for additional information on the subject.

Fungous Parasites of Ants

In the following account of the fungi which parasitize ants, I have left aside the endozoic Sporozoa and Schizomycetes, some of which are important agents of bacterial infections of caterpillars, bees, locusts, etc., but are not known or have not been studied among ants. Six families of true fungi, namely the Entomophthoraceæ, the Hypocreaceæ, the Laboulbeniaceæ, the Mucedinaceæ, the Stilbaceæ, and the Dematiaceæ, contain forms which attack living insects. In some other groups, such as the Saprolegniaceæ and the Pythiaceæ, certain species are commonly met with on dead insects; these are, however, mere saprophytes and cannot be properly included among the entomogenous fungi.

From the data collected in this chapter, it is evident that ants are remarkably immune from the attacks of parasitic fungi; only a few species of such ant parasites are known and these are rarely encountered. This is the more surprising since ants exist everywhere in great abundance and have probably been collected and studied in larger numbers than any other group of insects.

> At first sight ants would seem to be particularly favorable hosts for such parasites since these insects are in the habit of huddling together in masses in warm subterranean galleries, where the fungi might be supposed to develop luxuriantly and transmit their spores from ant to ant with great facility. Further consideration of the matter, however, leads to the conclusion that other habits of the ants must, in all probability, tend to suppress or render impossible the development of the fungi, except under unusual conditions. All ants devote a great deal of time and attention to cleaning their own integument and that of their nestmates. They are, indeed, forever combing and scraping the surfaces of their bodies with their tongues and strigils, so that fungi must find it difficult to gain a precarious foothold in their nests, to say nothing of an opportunity to proliferate. And even on the rare occasions, when this happens, important organs like the mandibles, antennæ, labium, maxillæ, palpi and eyes are kept scrupulously free from parasitic growth. (Wheeler, 1910a, p. 85.)

The ENTOMOPHTHORACEÆ constitute part of the very extensive class of alga-like fungi or Phycomycetes. By far the majority of the species of this family parasitize living arthropods, though a few genera grow on living or dead plants. "They are distinguished by the production of numerous hyphæ of large diameter and fatty contents, which, in the insect forms, ultimately emerge from the host in white masses of characteristic appearance and produce at their extremities large conidial spores which are violently discharged into the air and propagate the disease. The common house-fly fungus is perhaps the most familiar example of the kind, and no one can have failed to notice the affected flies in autumn or late summer adhering to looking-glasses or window-panes surrounded by a smoky halo of discharged conidia. In addition to these conidia the propagation of the fungus, after long periods of rest, may be provided for by the formation of thick-walled resting spores adapted to withstand successfully the most unfavorable conditions. These resting spores, which may be either sexual (zygospores), or asexual (azygospores), finally germinate and produce conidia that are discharged in the usual fashion and serve to infect fresh hosts." (Thaxter, 1888,

p. 136.) The parasitic forms in this family usually attack soft-bodied insects, such as flies, caterpillars, moths, butterflies, aphids, etc.; the infection results from contact with a conidial spore, which, adhering to the host, enters its body by means of a hypha of germination. These fungi have never been observed on ants, perhaps because they have not been properly looked for, though it is quite possible that the heavy, chitinous integument and the customary cleanliness of ants protects them against infection by such parasites.

The HYPOCREACEÆ belong to the class Ascomycetes, and among them several species of *Cordyceps* afford "by far the most conspicuous examples of entomogenous plants, many of which are of large size, or brightly colored" (Thaxter, 1888, p. 135). In this case, the polycellular mycelium pervades the tissues of the host, which is rapidly killed, and often produces asexual spores or conidia, borne on external hyphæ variously agglutinated or united. In this imperfect, more common condition, they are often described under the generic designation of "*Isaria*" and are then placed, together with other similar imperfect fungi, in the family Stilbaceæ. The mycelium finally produces outside the body of the insect a boll-shaped or club-like organ or fructification, carried on a stalk sometimes several inches in length. The swollen portion of this external stroma bears numerous ascocarps or perithecia containing the spores, which are formed within elongate cells, the asci. As many as eleven species of *Cordyceps* have been described from ants, but some of these are very imperfectly known, especially with regard to the structure of the asci and spores, so that they are much in need of further study. Furthermore, all *Cordyceps* seem to be little or not particular in the choice of their host, the same species often growing indifferently on insects of several orders.

CORDYCEPS E. Fries

Cordyceps E. FRIES, 1818, 'Observ. Mycol. Flor. Suec.,' p. 316.

Cordyceps australis (Spegazzini)

Cordyceps unilateralis subspecies *australis* SPEGAZZINI, 1881, An. Soc. Cientif. Argentina, XII, p. 80 (of separate).

Cordyceps australis SACCARDO, 1883, 'Syll. Fungorum, Pyrenomyc.,' II, p. 571. SPEGAZZINI, 1889, Bol. Ac. Nac. Ciencias Córdoba, XI, p. 536. M. C. COOKE, 1892, 'Vegetable Wasps and Plant Worms,' p. 34. MASSEE, 1895, Ann. of Botany, IX, p. 15; 1898, Revue Mycologique, XX, p. 86. A. MÖLLER, 1901 'Phycom. u. Ascom., Unters. aus Brasilien,' p. 218, Pl. VI, figs. 92 and 93.

Cordiceps australis P. HENNINGS, 1902, Hedwigia, XLI, p. 10.

This species seems to be rather common in southern Brazil, where it was originally discovered near Apiahy on *Pachycondyla striata* Smith by Puiggari, and later seen three times on the same species of ant at Blumenau by A. Möller. It has also been found in southern Brazil on various beetles.

Cordyceps japonensis Hara

Cordyceps japonensis Hara, 1914, Botan. Magazine, Tokyo, XXVIII, pp. 348 and 351, fig. I.

Cordyceps species, Hara, 1913, Nawa's Insect World, Gifu, Japan, XVII, p. 472, figs. *A–D*.

Described from Japan: Province Mino, Kawauye-mura and Province Mino, Kakumuno-ga-hara (K. Hara Coll.); growing on an unidentified ant, to judge from the description, a species of *Camponotus*.

Cordyceps formicivora (Schrœter)

Torrubia formicivora Schrœter, 1894, in Cohn, 'Kryptogamen-Flora von Schlesien,' III, 'Pilze,' 2, p. 276.

Cordyceps formicivora Saccardo, 1895, 'Syll. Fungorum,' XI, p. 366.

Growing from the thorax of *Camponotus ligniperdus* (Latreille) on the Warthaberg, Frankenstein, Silesia (Schrœter Coll.).

Cordyceps Lloydii Fawcett

Cordyceps Lloydii Fawcett, 1886, Ann. Mag. Nat. Hist., (5) XVIII, p. 316, fig. Saccardo, 1891, 'Syll. Fungorum,' IX, p. 1000. M. C. Cooke, 1892, 'Vegetable Wasps and Plant Worms,' p. 36, fig. 9. Massee, 1895, Ann. of Botany, IX, p. 20; 1898, Revue Mycologique, XX, p. 90. C. G. Lloyd, 1919 (June), Mycological Notes, No. 59, p. 856, fig. 1437.

This fungus was originally described from a specimen growing on *Camponotus abdominalis* (Fabricius), =*C. atriceps* (F. Smith), and found on the banks of the Puruni River, British Guiana (G. A. Lloyd Coll.). C. G. Lloyd has recently recorded it from Uganda, where it was obtained by W. Gowdey, growing on a dead worker of *Paltothyreus tarsatus* (Fabricius) attached by means of its mandibles to the stalk of a plant: "The fungus is a very minute, white club with a small capitate head and seems to agree very well with the original figure." To judge from C. G. Lloyd's photographs, this parasite is very different from the *Cordyceps* commonly found in the Belgian Congo on the same ant, *Paltothyreus*, and referred below to *C. myrmecophila* (Cesati).

Cordyceps myrmecophila (Cesati)

Hypocrea (Cordyceps) myrmecophila CESATI, 1846, in Klotzsch, 'Herb. Mycol., Centuria XI, cura L. Gravenhorst,' No. 1033 (exsiccata with description). D. v. SCHLECHTENDAL, 1846, Botan. Zeitung, IV p. 877. CESATI, 1855, ibid., XIII, p. 75.

Campylothecium myrmecophilum CESATI, 1846, in Klotzsch, 'Herb. Mycol., Centuria XI,' No. 1033.

Hypocrea myrmecophila BERKELEY AND BROOME, 1851, Ann. Mag. Nat. Hist., (2) VII, p. 186.

Cordyceps myrmecophila CESATI, 1858, in Klotzsch, 'Herb. Mycol., Ed. Nov., Centuria VIII, cura L. Rabenhorst,' No. 719 (exsiccata with description). D. v. SCHLECHTENDAL, 1858, Botan. Zeitung, XVI, p. 302. M. J. BERKELEY, 1860, 'Outlines of British Fungology,' p. 382. W. NYLANDER, 1869, Notis. Sällsk. pro Fauna et Flora Fenn. Förhandl., X, p. 88, Pl. II, figs. *4a–d* (separate in 1868). SACCARDO, 1883, 'Syll. Fungorum, Pyrenomyc.,' II, p. 566. G. MASSEE, 1886, Grevillea, XV, No. 73, p. 2. M. C. COOKE, 1892, 'Vegetable Wasps and Plant Worms,' p. 31, fig. 6. MASSEE, 1895, Ann. of Botany, IX, p. 14; 1898, Revue Mycologique, XX, p. 85. RABENHORST, WINTER AND PAZSCHKE, 1890, 'Fungi Europæi,' No. 3649 (exsiccata). F. J. SEAVER, 1910, 'North American Flora,' III, pt. 1, p. 54. STITZ, 1911, Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08), III, p. 377, footnote. C. REA, 1914, Trans. Brit. Mycol. Soc., IV, pt. 2, (1913), pp. 199, 203, and 213.

Cordyceps (Entomogena) myrmecophila CESATI, 1861, Commentario della Soc. Crittogamol. Italiana, I, No. 2, p. 61, Pl. IV, figs. II, 1–4.

Torrubia myrmecophila M. C. COOKE, 1871, 'Handbook of British Fungi,' II, p. 771. PHILLIPS AND PLOWRIGHT, 1875, Grevillea, III, p. 126.

Cordiceps myrmecophila P. HENNINGS, 1904, Hedwigia, XLIII, 4, p. 248. STITZ, 1916, Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11, I, p. 371.

This is the most frequently observed fungous parasite of ants, being recorded from the tropical and temperate parts of both hemispheres and attacking many kinds of insects besides ants. It was discovered by Cesati in 1846, at Brescia, in Lombardy, Italy, some three hundred individuals of the same nest being infested by the fungus[1]; the species of ant was not recorded at the time, but W. Nylander in 1869 identified Cesati's specimens—from Klotzsch' exsiccata—as *Formica fusca* Linnæus. W. Nylander mentions it also as occurring in Finland (Jalguba on Lake Onega; A. Kuhllhem Coll.), growing out of the anterior part of the pronotum of *Formica rufa* Linnæus. It was again noted by Hennings from Brazil (Rio Juruá, Juruá-Miry; E. Ule Coll.) on *Dinoponera grandis* (Guérin).

In tropical Africa it seems to show a predilection for the common large ponerine ant, *Paltothyreus tarsatus* (Fabricius). Stitz (1911, p.

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[1] "Ce fut un cimetière de fourmis tout entier qui se parait de cette jolie Sphériacée." (Cesati, 1855, p. 75.)

377, footnote) mentioned the first African specimens growing on an ant of that species collected by Grauer in the forest near Kindu, Belgian Congo; and Schubotz also found it on the same ant in the Ubangi District. It is by no means rare, from my own experience and that of Messrs. Lang and Chapin, to find dead specimens of *Paltothyreus tarsatus* firmly attached with their closed mandibles to a leaf, a grass-stalk, or a stick, several inches or a few feet above the ground, while a long-stalked *Cordyceps* protrudes from the body. Though this position is often observed in ants that die from fungous diseases, it is nevertheless remarkable in this case since *Paltothyreus* is a predaceous, strictly terrestrial ant, not known to climb the vegetation normally. The stroma of the fungus grows out of the side of the thorax, as a rule between one of the coxal articulations. It is a slender stalk, 2 cm. or more long, and ends in a club-shaped fructification bearing the ascocarps. More rarely two such fructiferous stroma are borne by the same ant.

Cordyceps proliferans (P. Hennings)

Cordiceps proliferans P. Hennings, 1904, Hedwigia, XLIII, 4, p. 248, Pl. iv, figs. 6 and 6a.

Cordyceps proliferans P. and D. Saccardo, 1905, 'Syll. Fungorum,' XVII, p. 825.

Described from Rio Juruá, Marmellos, Brazil, growing on *Dinoponera grandis* (Guérin) (E. Ule Coll.).

Cordyceps Ridleyi Massee

Cordyceps Ridleyi Massee, 1899, Bull. Misc. Inform. Bot. Gard. Kew, Nos. 153–154, p. 173. Saccardo and Sydow, 1902, 'Syll. Fungorum,' XVI, p. 613. Chipp, 1921, The Gardens' Bull., Straits Settlements, II, p. 326.

Found in Selangor, Malay Federated States (Ridley Coll.), springing in considerable numbers from the head, thorax, abdomen, and legs of an unidentified ant; some imperfect stromata also on the antennæ. This is a small fungus, the stromata being 3 to 4 mm. high. According to Chipp (1921) the host is "*Formica gigas.*"[1]

Cordyceps Sherringii Massee

Cordyceps Sherringii Massee, 1891, Ann. of Botany, V, p. 510, figs. 2-6 (on p. 509). M. C. Cooke, 1891, Grevillea, XX, No. 94, p. 39. Massee, 1892, Bot. Centralbl., LI, p. 334; 1895, Ann. of Botany, IX, p. 27; 1899, Revue Mycologique, XXI, p. 1, Pl. clxxxiii, figs. 5–9.

Cordyceps Speeringii M. C. Cooke, 1891, Grevillea, XX, p. 15.

Cordyceps Sherringii M. C. Cooke, 1892, 'Vegetable Wasps and Plant Worms,' p. 35, fig. 8. Saccardo, 1895, 'Syll. Fungorum,' XI, p. 366.

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[1] Probably *Camponotus* (*Dinomyrmex*) *gigas* (Latreille).

Grenada, West Indies (Sherring Coll.).

"Gregarious on an ant, springing from various parts of the body, most firmly attached to the frond of a fern by a dense mass of pale ochraceous mycelium."

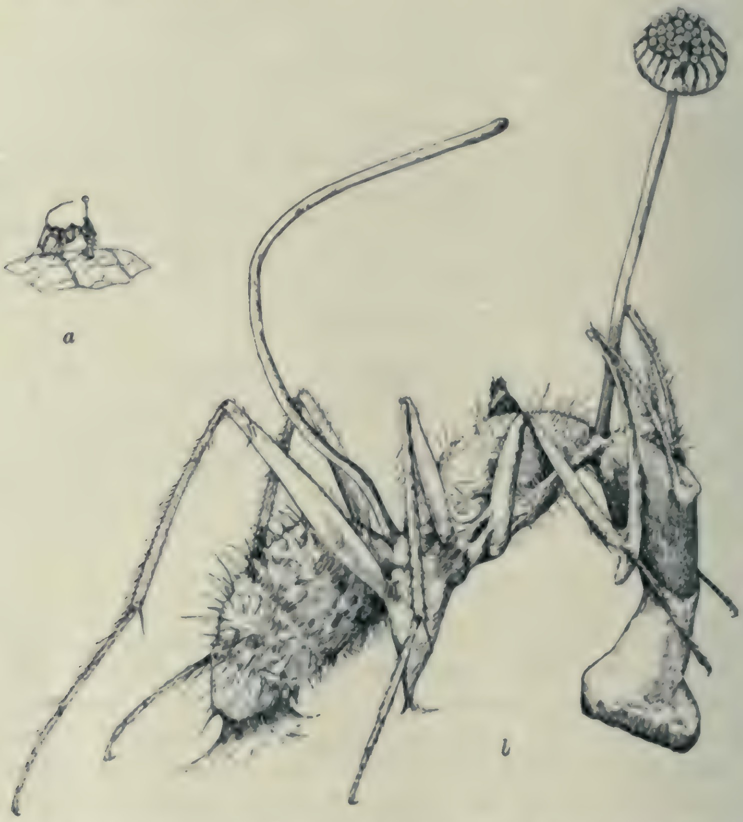

Fig. 77. *Cordyceps subdiscoidea* (P. Hennings) growing on *Camponotus* (*Myrmothrix*) *abdominalis* (Fabricius), at Kalacoon, Bartica District, British Guiana: a, natural size; b, × 10.

Cordyceps subdiscoidea (P. Hennings)

Cordiceps subdiscoidea P. Hennings, 1902, Hedwigia, XLI, p. 168.
Cordyceps subdiscoidea P. and D. Saccardo, 1905, 'Syll. Fungorum,' XVIII, p. 825

This curious fungus was described from the confluence of the Para and Surinam Rivers, Dutch Guiana, on the thorax of an unidentified ant (J. Michaëlis Coll.). Prof. Wm. M. Wheeler has recently found at Kalacoon, British Guiana, a beautiful specimen which I refer provisionally to this species (Fig. 77), though it may be undescribed. It was growing on a dead worker of *Camponotus* (*Myrmothrix*) *abdominalis* (Fabricius), fixed on a leaf of a low bush in the forest near the Tropical Research Station of the New York Zoological Society.

Cordyceps subunilateralis (P. Hennings)

Cordiceps subunilateralis P. Hennings, 1902, Hedwigia, XLI, p. 168; 1904, Nerthus, Pl. 1, fig. 9.

Cordyceps subunilateralis P. and D. Saccardo, 1905, 'Syll. Fungorum,' XVII, p. 826.

From the confluence of the Para and Surinam Rivers, Dutch Guiana, on the thorax of an unidentified ant (J. Michaëlis Coll.).

Cordyceps unilateralis (L. and C. Tulasne)

Torrubia unilateralis L. and C. Tulasne, 1865, 'Selecta Fung. Carpologia,' III, p. 18, Pl. I, figs. 3-4. Berkeley and Cooke, 1876, Journ. Linn. Soc. London, Botany, XV, p. 394.

Cordyceps unilateralis Saccardo, 1883, 'Syll. Fungorum, Pyrenomyc.,' II, p. 570. Fawcett, 1886, Ann. Mag. Nat. Hist., (5) XVIII, p. 317. Thaxter, 1891, Botan. Gazette, XVI, p. 203. M. C. Cooke, 1892, 'Vegetable Wasps and Plant Worms,' p. 33, fig. 7. Massee, 1895, Ann. of Botany, IX, p. 15; 1898, Revue Mycologique, XX, p. 86. Spegazzini, 1912, An. Mus. Nac. Hist. Nat. Buenos Aires, XXIII, p. 76.

This is a rather generally distributed parasite of ants, and it attacks other insects too. Originally described from Brazil on *Atta cephalotes* (Linnæus), it was again found there on the same ant by Traille.[1] Fawcett records it on *Camponotus abdominalis* (Fabricius), =*atriceps* (Smith), also from Brazil, and on *Echinopla melanarctos* Smith and *Polyrhachis merops* Smith, both collected by A. R. Wallace at Tondano, a village in the island of Celebes. Thaxter found it in North America on an ant which was not further specified at the time, but is, according to Prof. Wheeler's identification, *Camponotus herculeanus* (Linnæus) subspecies *pennsylvanicus* (De Geer) from North Carolina.[2] Finally, Spegazzini mentions it from an unidentified ant found at Puerto León, Misiones, Argentina.

The external part of this *Cordyceps* consists of a black, very slender, thread-like stroma, 13 to 20 mm. long and ¼ to ⅓ mm. thick at the base,

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[1] An unidentified *Cordyceps* is figured by J. R. Inda (1907, p. 4, fig. 2) on a leaf-cutting attine ant form Cuarnava and Jalapa, Mexico.

[2] According to information kindly given by Prof. Wheeler, there are also in Prof. Thaxter's collection unidentified *Cordyceps* on *Camponotus herculeanus* subspecies *pennsylvanicus* variety *noveboracensis* (Fitch) from Maine, and on *C. abdominalis* (Fabricius) from Trinidad. An unidentified *Cordyceps* has also been mentioned on *Camponotus sexguttatus* from Brazil by Fawcett (1886, p. 317).

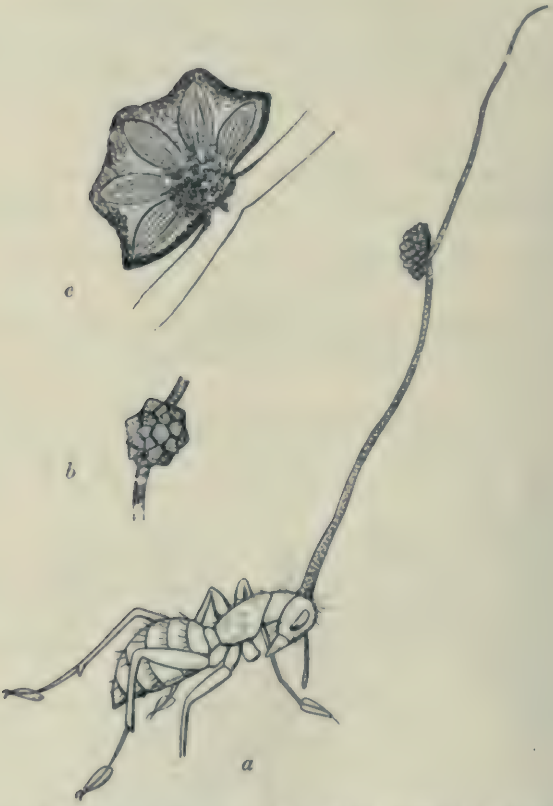

Fig. 78. *Cordyceps unilateralis* variety *javanica* F. v. Hohnel, growing on *Camponotus* species, near Batavia, Java: a, ant with complete fungus, × 5.5; *b*, capitulum of asci, × 7; *c*, longitudinal section of capitulum showing perithecia, × 30 (after v. Höhnel, 1909.)

feebly bent about or above the middle of its length, where it bears on one side the perithecia fused into a subglobose or hemispherical head, 1 to 2 mm. in diameter, with rosette-like protuberances.

Cordyceps unilateralis variety **javanica** F. v. Höhnel

Cordyceps unilateralis variety *javanica* F. v. Höhnel, 1909, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVIII, Abt. 1, p. 305, Pl., figs. *a-h*. Saccardo and Trotter, 1913, 'Syll. Fungorum,' XXII, p. 512.

The stroma of this fungus (Fig. 78 *a-c*) was growing out between the head and thorax of an unidentified ant, probably, to judge from the drawing, a species of *Camponotus*, collected near Batavia, Java, by van Rozenburg.

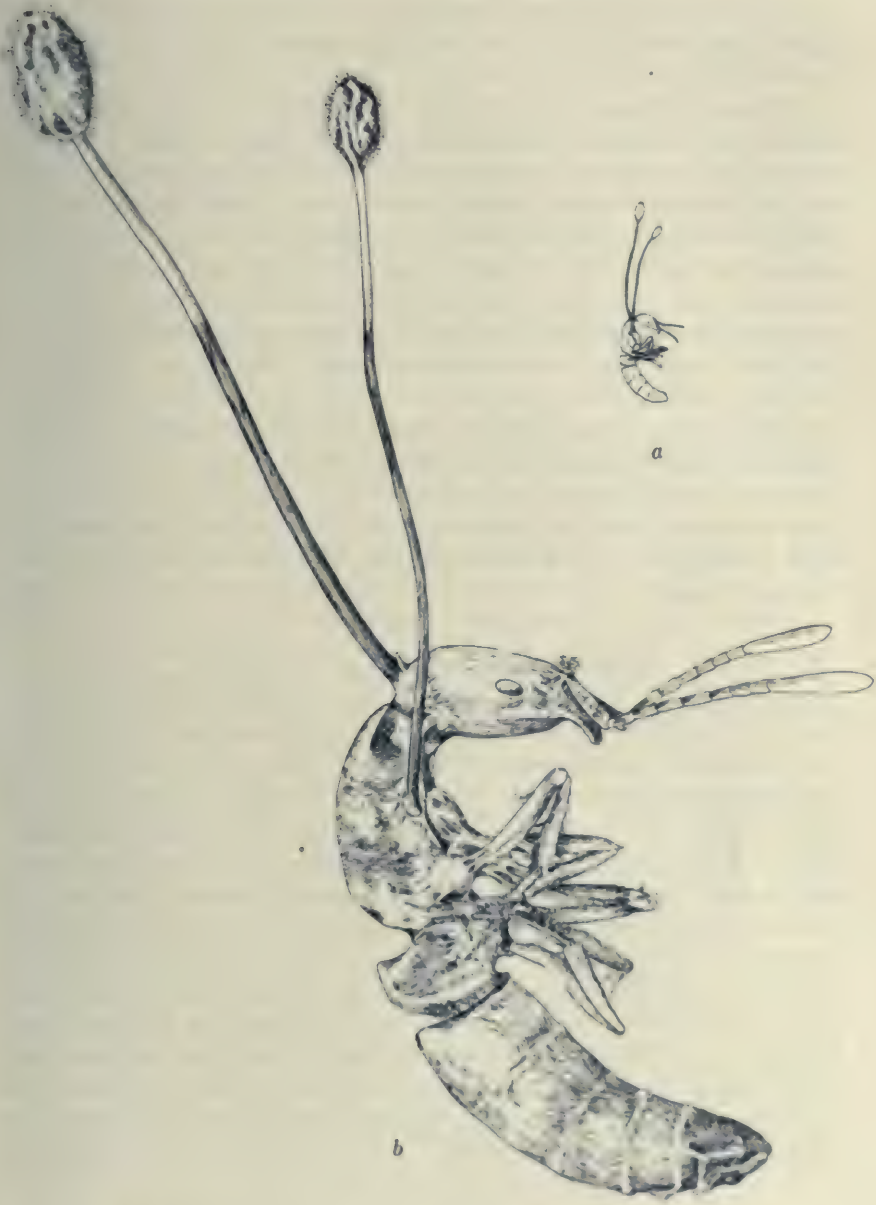

Fig. 79. *Isaria myrmicida* C. G. Lloyd, growing on *Pachycondyla striata* F. Smith, at Tijuca, in the vicinity of Rio de Janeiro, Brazil: a, natural size; *b*, × 7.

Isaria myrmicidæ C. G. Lloyd

Isaria myrmicidæ C. G. Lloyd, 1920, Mycological Notes, No. 62, p. 915, Pl. CXLIII, figs. 1636 and 1637.

The above name is given by C. G. Lloyd to a parasite found in Brazil by J. Rick on an unidentified ant; his figure evidently represents the petiole and gaster of a ponerine, perhaps of the same species of *Pachycondyla* mentioned below as host of this fungus. The brief description reads as follows: "This is not a *Cordyceps* as would appear from the photograph but an *Isaria* which is only named for convenience in the museum. Our figure (Fig. 1636) enlarged six-fold tells all to be told about it. Fig. 1637 is natural size. The stem is about a centimeter long, slender and black. The head is cylindrical and white. Spores are 'pip-shape,' 2 × 8."

Fig. 79 shows a parasite of *Pachycondyla striata* F. Smith,[1] which is evidently Lloyd's "*Isaria myrmicidæ*." The drawing was made from a specimen in the Herbarium of the New York Botanical Garden kindly loaned to me by Dr. N. L. Britton and Dr. F. J. Seaver. It was obtained by J. N. Rose and P. G. Russell in 1915 at Tijuca, in the vicinity of Rio de Janeiro, Brazil.

Stilbum formicarum Cooke and Massee

Stilbum formicarum Cooke and Massee, 1889, Grevillea, XVIII, No. 85, p. 8. M. C. Cooke, 1892, 'Vegetable Wasps and Plant Worms,' p. 38, Pl. I, fig. 12.

An undetermined species of ant, sent from Cheltenham, Victoria, Australia, was bearing upon its body a little *Stilbum*, with elongated slender stems, from five to eight millimeters in length, black, and flexuous, slightly thickened towards the base, and bearing at the apex an obovate, pink-colored capitulum or head, with elliptical conidia (10μ long and 3μ broad). Several of these fungi occurred on the body of each dead insect.

The genus *Stilbum* comprises imperfect fungi, usually placed in a family Stilbaceæ. Most of the species are saprophytic and only a few have been found on insects. It is quite possible that the Australian form mentioned here represents the conidial form of some ant-attacking *Cordyceps*, and I have, therefore, thought it convenient to mention it in connection with the Hypocreaceæ.

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[1] The ant was identified by Prof. Wheeler.

The LABOULBENIACEÆ or Laboulbeniales constitute by far the most highly specialized and most interesting of fungoid parasites of insects. All are found growing on living arthropods exclusively. The family is usually included among the Ascomycetes and, even in his most recent papers, Thaxter sees no sufficient reason why it should not be placed in the Pyrenomycetes. Because of their combining in some respect peculiarities of the true Ascomycetes with others shown by certain Algæ of the class Florideæ, certain mycologists suggest that these fungi be considered as a class of themselves, for which the names Phycascomycetes or Laboulbeniomycetes have been used.

The following brief account of the Laboulbeniaceæ is adapted from R. Thaxter's admirable monographic studies of these plants and will, it is hoped, enable entomologists to recognize them without difficulty. Unlike the *Cordyceps* described above, they are inconspicuous and, when examined *in situ* on the host insect, appear in general like minute, usually dark-colored or yellowish bristles or bushy hairs, projecting from its chitinous integument either singly or in pairs, more commonly scattered, but often densely crowded over certain areas on which they form a furry coating. When studied with a proper magnification, the structure of a fully developed parasite corresponds to the following general scheme.

> A (polycellular) main body, or *receptacle*, is fixed by means of a blackened base, or *foot*, to the integument of the host, and consists in most cases of a very small number of cells differently arranged in different genera. This receptacle gives rise above to certain peculiar appendages of very variable form, commonly connected with the production of the male sexual organs; while from the same individual, with few exceptions in which the plants are diœcious, female organs are also variously produced from which *perithecia* are eventually developed. In the perithecia, which may arise singly or in considerable numbers from a given individual, and which are quite remarkable in structure, are produced the reproductive bodies or *ascospores* that are formed in *asci* identical in all respects with the organs thus named in other members of the great group of ascomycetous fungi. The ascospores thus formed germinate on the surface of the host to which they become attached by a blackened modification of their basal extremity, and, without the formation of any hyphæ, grow directly to new individuals by means of successive cell divisions. (Thaxter, 1896, p. 198.)

Perhaps the most remarkable peculiarity of the Laboulbeniaceæ is their ability to thrive freely on their host without interfering much with its activity, inflicting little if any appreciable injury. The parasitism is external and, except in rare instances in which the foot sends into the body a rhizoid-like haustorium, the parasite derives its nourishment through a at most slight perforation of the host's integument. Indeed, so feeble are the ill-effects of their parasitism that the idea has at one time been advanced these fungi be mere saprophytes, not feeding on their host but absorbing from the surrounding humid air such elements as are needed for their development (Cavara, 1899). Rick (1903), commenting upon the abundance of *Rickia Wasmannii* in some ant colonies, goes even a step further. "The animals," he writes, "apparently suffer but little or almost not from the fungus; one finds decidedly populous colonies which are much attacked. Possibly the animals may even derive some benefit from the fungus. It is not much out of the question to think of a kind of symbiosis, though I cannot for the present give any further indication concerning this point. Perhaps the fungus could be of advantage to the ants in providing them with sugar."

There is, however, not the slightest proof for Rick's surmise that the fungus is of any real use to its host, while there is plenty of evidence that the Laboulbeniaceæ are true parasites. "The rigid limitation of species of Laboulbeniales to single genera or even species, of insects, which holds in general throughout the group, could hardly, it would seem, be explained on the basis of pure saprophytism; and although, as previously stated, the growth of these plants is not associated with any appreciable injury to the host, it is nevertheless a true parasitism of a typically obligate type." (Thaxter, 1908, p. 223.) Moreover, the exact manner in which the fungus derives its food from its host is still not quite clear. The occurrence of a number of rhizoidal forms seems to render it certain that all Laboulbeniaceæ feed on the juices of the insect; in the ant parasites, as in a majority of cases, these nutritive elements are absorbed, without penetration, through the sucker-like foot (Thaxter, 1908, p. 248). According to Cépède (1914, p. 396), the fungus takes from the superficial layers of chitin certain carbohydrates which are localized there (glucose and glycogene).

The greater number of Laboulbeniaceæ attack beetles, especially of the family Carabidæ; they are much rarer on other insects and only the three following species have hitherto been recorded from ants. They are among the smallest members of the family, not exceeding one-tenth of a millimeter in total length in the North American *Laboulbenia formicarum;* the two other forms being slightly larger.

Rickia Wasmannii Cavara

Rickia Wasmannii Cavara, 1899, Malpighia, XIII, p. 182, Pl. vi. Rick, 1903, Œsterreich. Bot. Zeitschr., LIII, p. 163, fig. Thaxter, 1902, Proc. American Ac. Arts Sc. Boston, XXXVIII, p. 39; 1908, Mem. American Ac. Arts Sci. Boston, XIII, pt. 6, p. 248, Pl. xxxiv, figs. 1–13. Cépède and Picard, 1909, Bull. Scientif. France et Belgique, XLII, p. 252. Picard, 1913, Bull. Soc.

Mycolog. France, XXIX, p. 511. Spegazzini, 1914, Redia, X, (1915), p. 29, Pl. I, fig. 2. Rehm, 1903, Ascomyceten, No. 1451 (exsiccata).

This is apparently the only fungous ant parasite commonly found in Europe. Originally described from Linz on the Rhine, Germany, where Wasmann found it on *Myrmica lævinodis* Nylander, it was observed by Rick on the same ant at several other localities in Luxemburg (Belle Vue), Germany (Berncastel on the Moselle), and Austria (Feldkirch and Garina in the Vorarlberg). Spegazzini mentions it from Italy on *Myrmica scabrinodis* Nylander (Fig. 80a-*b*).

Donisthorpe (1912, p. 5; 1913, p. 96; 1915, p. 154) mentions the discovery at Rannoch, England, of a nest of *Leptothorax acervorum* (Fabricius), all the ants of which were covered with a fungus, though quite alive. The specimens, unfortunately, were lost, but the author thinks that the fungus was probably a species of Laboulbeniaceæ.

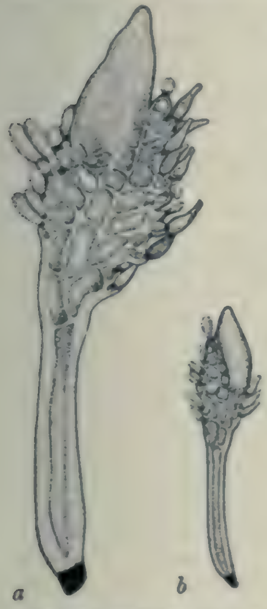

Fig. 80. *Rickia Wasmannii* Cavara, a parasitic fungus of *Myrmica lævinodis* Nylander in Europe. Mature individual: a, × 600; *b*, × 290 (after Thaxter, 1908).

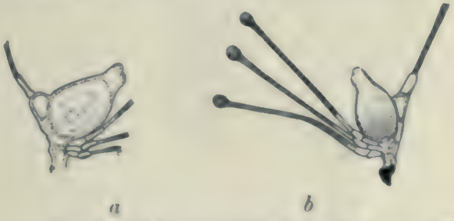

Fig. 81. ***Rickia formicicola*** **Spegazzini, a parasitic fungus of** ***Prenolepis silvestrii*** **Emery in Argentina. Two mature individuals, × 300 (after Spegazzini, 1917).**

Rickia formicicola Spegazzini

Rickia formicicola, 1917, Spegazzini, An. Mus. Nac. Hist. Nat. Buenos Aires, XXIX, p. 665, fig. núm. 195.

This species (Fig. 81) was found in the island of Santiago, La Plata, Argentina, growing on *Prenolepis silvestrii* Emery.

Laboulbenia formicarum Thaxter

Laboulbenia formicarum, 1902, Thaxter, Proc. American Ac. Arts Sci. Boston, XXXVIII, p. 39; 1908, Mem. American Ac. Arts Sci. Boston, XIII, No. 6, p. 359, Pl. LVIII, figs. 14 and 15. Wheeler, 1910, Psyche, XVII, pp. 83-86. J. Bequaert, 1920, Bull. Brooklyn Ent. Soc., XV, p. 71.

This parasite (Fig. 82*a-b*) attacks various species of North American ants; strange to say, it has only been recorded thus far from the vicinity of Boston, where it appears to be rather common. Thaxter discovered it at Cambridge, Massachusetts, on *Lasius niger* variety *americanus* Emery and *Formica subpolita* variety *neogagates* Emery. Wheeler found the same fungus infesting nearly all the nests of *Lasius niger* variety *neoniger* Emery, on the seashore at Ellisville, Massachusetts, and gives some interesting details with regard to the ecology of the infested colonies.

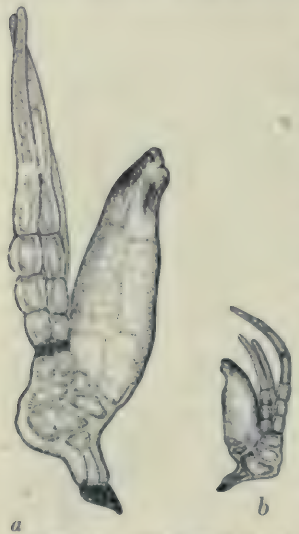

Fig. 82. *Laboulbenia formicarum* Thaxter, a fungous parasite of various North American ants Mature individuals: a, × 625; *b*, × 260 (after Thaxter, 1908).

> On the beach itself, which consists of a deep layer of pure sand, there are colonies of *Formica fusca* variety *argentata* Wheeler, *Myrmica scabrinodis* Nylander variety *sabuleti* Meinert, *Tapinoma sessile* Say and *Lasius neoniger*. The last is far and away the most abundant and its workers are of large size. None of the ants in this locality, including the *neoniger*, was found to be infested with Laboulbeniaceæ. On the border of the salt meadow, however, immediately adjoining the beach, where the soil is moist, consisting of a mixture of rather sour, decomposing humus mixed with sand, and probably not infrequently wetted by the spray and occasionally even submerged at very high water, the only ant is *L. neoniger*, but its colonies are less populous than those on the beach, the workers are distinctly smaller and are practically all infested with the *Laboulbenia*. Passing over from this zone of infestation to the pasture land adjoining the salt meadow, the variety *neoniger* is replaced by *L. niger* L. variety *americanus* Emery which is the form of the species commonly occurring in higher and dryer pastures and fields. None of the workers of this form, which lacks on the scapes and legs the erect hairs so conspicuous in the variety *neoniger*, was found to be infested with the fungus. It would seem, therefore, that while *neoniger*, unlike any of the other ants, is able to exist in a depauperate condition in the damp, sour soil at the edges of salt meadows, it does so only at the risk of becoming infested with *Laboulbenia formicarum*. Indeed, the infestation of the ants in this strip of littoral at Ellisville is often so excessive that they resemble hedgehogs, fairly bristling with tufts of the fungus. (Wheeler, 1910a, p. 84.)

Though *Laboulbenia formicarum* may occur on all parts of its host, it appears from Wheeler's observations that it grows most abundantly on the abdomen, middle and hind femora and tibiæ, and posterior portions of the head. The thorax and coxæ, as a rule, are entirely free from the fungus; the clypeus and gula are generally free, and this seems to be invariably the case with the mandibles, antennal funiculi, palpi, labium, maxillæ, and eyes. In a very few specimens, one or two of the little plants were seen on the antennal scapes, but, as a rule, these organs are perfectly clean.

In August 1919, I took a worker of *Formica pallide-fusca* subspecies *schaufussi* Mayr infested with *Laboulbenia formicarum* at Forest Hills near Boston. I was, however, unable to locate the nest to which this individual belonged, but this observation shows once more that this fungus, though restricted to ants, attacks indifferently many species (Bequaert, 1920). Prof. Thaxter has also informed Prof. Wheeler that he has taken this *Laboulbenia* on various species of *Formica*, at Cambridge, Massachusetts.

Several so-called "imperfect fungi"—incompletely developed, conidia-bearing or sterile stages of various Ascomycetes—are known to attack insects, and some of these have been seen on ants. I have mentioned above *Stilbum formicarum* Cooke and Massee and have also alluded to the *Isaria* stage of *Cordyceps*, which may be expected on ants, since so many species of the latter genus have been found in the asci-bearing stage on these insects. H. Bischoff (1912) has mentioned the finding by Quiel, at Potsdam, Germany, of two nests of *Formica rufa* heavily infested with fungous growths, about the size of a pin-head and attached mainly to the thorax, more rarely to other parts of the body. The ants were apparently but little hampered by their parasites. From cultures obtained with these fungi, Bischoff concludes that they belonged to several species, among them a *Mucor* (of the *spinulosus* group), a *Penicillium*, and a yeast with sexual reproduction; characteristic brown hyphæ present in the tufts on the ants, were not obtained in the cultures. More recently, Thaxter (1914, p. 239) found in the vicinity of Cambridge, Massachusetts, a fungus forming blackish incrustations on various parts of ants, and giving rise to a few short, colorless, erect branches: the exact nature of this plant has not been determined, nor is the name of its host mentioned.[1]

Thaxter (1891, p. 203, Pl. xx, figs. 1–9) has described, under the name *Desmidiospora myrmecophila*, a new genus and species of fungus which was growing luxuriantly on a large black ant fastened to the under side of a rotting log in Connecticut.[2] The hyphæ, much branched and septate, covered the host in a white flocculent mass; they emerged

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[1] J. Leidy (1884) has recorded finding in Pennsylvania a *Camponotus pennsylvanicus* under the bark of a decaying tree; it was infected with a fungus which spread through every part of the body. This may have been a saprophytic fungus which had invaded the ant after death.

[2] This ant has recently been identified by Prof. Wheeler in Prof. Thaxter's collection as *Camponotus herculeanus* subspecies *pennsylvanicus* (DeGeer). Prof. Thaxter also possesses the same fungus from New Hampshire, growing on the subspecies *pennsylvanicus* and its variety *noveboracensis* (Fitch).

especially from between the abdominal segments, enveloping the insect more or less completely and extending a short distance over the substratum. The spores are of two kinds, the microconidia being minute ($12 \times 2\mu$), hyaline, subfusiform, and produced at the apex of subulate lateral basidia; while the macroconidia are much larger, terminal, brown, flat, multilocular, irregularly lobed, up to $\frac{1}{10}$ mm. broad ($80-100 \times 68-90\mu$ and $12-14\mu$ thick). Thaxter remarks that it is not impossible that this fungus is an imperfect form of some *Cordyceps* or possibly parasitic on an immature *Isaria* or *Cordyceps* previously developed within the insect. As it is, Thaxter places *Desmidiospora* among the Hyphomycetes and Lindau[1] regards it as genus of the Mucedinaceæ. Some years ago Patouillard (1892) described, under the name *Hirsutella entomophila*, a curious fungus found growing on a beetle in Ecuador. At first sight it resembled an *Isaria*, but Patouillard thought he had observed that the spores were borne on basidia; he, therefore, included this parasite among the Basidiomycetes, placing it in the Clavariæ. Recently, however, Speare (1920) has shown that this, as well as similar fungi, do not produce true basidia and must be removed from the Basidiomycetes. It is rather a definite form of imperfect fungi, probably a stage of one or more species of *Cordyceps* or related genera. In the same paper, Speare remarks apropos of *Desmidiospora myrmecophila* Thaxter (p. 65): "While its resting spores are anomalous in character, and although no structures analogous to the synnemata of *Hirsutella* were described, its subulate sporophores and fusoid spores are of the same type as the corresponding organs of the form under consideration."

A snowy white mould, *Sporotrichum minimum* Spegazzini (1881, pt. 4, p. 123 of reprint; Saccardo, 1886, p. 101; M. C. Cooke, 1892, p. 37), also one of the Mucedinaceæ, was found in Argentina upon the putrescent body of *Acromyrmex lundii* (Guérin), in a rotten trunk. It was diffused over the insect, at first in a powdery and then a cottony white stratum, forming minute tufts. The threads were creeping and densely interwoven, branched, very slender (scarcely 2μ in diameter), sparingly septate, hyaline, with conidia scattered here and there.

It is possible that both this *Sporotrichum* and Thaxter's *Desmidiospora myrmecophila* are mere saprophytes, which have grown over the ant after the death of the insect.

Hormiscium myrmecophilum Thaxter, another imperfect fungus found on ants, is described by Thaxter (1914, p. 238, Pl. XIX, figs. 22–25) as follows: "Filaments nearly hyaline, becoming brownish, darker near the base, closely septate, the cells often as broad as, or broader than long, undifferentiated, distally bluntly rounded, erect or curved upward, rigid, simple, less frequently sparingly branched, tapering but slightly if at all, one to several arising from a deeply blackened foot of variable size and shape. Maximum length about 280μ by 7–8μ in width."[1] It was found on various parts of a species of *Pseudomyrma* collected by W. M. Mann along the Amazon River, Brazil; the majority of the individuals taken from a nest were infected by the fungus, which is sufficiently large to be readily visible as it projects from the surface of the host. It produces no differentiated cell-groups or definite spores, as far as has been observed, and appears to propagate itself by fragmentation only, the filaments proliferating after a terminal portion has been broken off. The opaque and somewhat variable foot, by which the individuals are attached to the surface of the host, appears to correspond to such a small fragment broken from a hypha, which, adhering laterally, becomes blackened and indurated, and gives rise to new filaments, while at the same time it serves the office of attachment as well as of food absorption. The other members of the genus *Hormiscium* are saprophytic, being mostly found on decaying vegetable matter; it is placed in the family Dematiaceæ among the Hyphomycetes.

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[1] In Engler and Prantl, 1900, Die Natürl. Pflanzenfam., I, Abt. 1**, p. 454.

Finally, I must mention that Donisthorpe, in his treatise of British ants (1915, p. 235, fig. 86; see also Donisthorpe, 1913, pp. 96–97), figures a worker of *Lasius umbratus* variety *mixto-umbratus* Forel with patches of algæ on body and legs. Concerning this parasite, he expresses himself as follows:

> On August 11th, 1912, when at Weybridge in company with Professor Wheeler, we found two colonies of this variety, very many of the ants of both being infested with a curious dark brown warty growth in patches on parts of the body and legs—this Wheeler thought might be a fungus which was unknown to him. I kept a number of these ants in captivity, and added uninfected workers of *umbrata* from other localities; the growth however did not increase nor spread to the new ants, but rather seemed to decrease. I sent some of the infested ants alive and others in spirit, to Dr. Baylis Elliott, and she considered the patches were colonies of unicellular organisms growing on the outside of the ants; eventually she came to the conclusion that they were not fungoid growths, but probably colonies of an alga.

Intracellular Bacteria of Ants

In various groups of insects unicellular organisms of a fungous or bacterial nature have been discovered inside certain cells of the body. They are apparently not parasites, but must rather be considered as living in symbiosis with their host. Special devices, often of a complicated nature, assure their transmission within the insect egg from one generation to another, so that they have become normal constituents of all the members of certain species, genera, families, or even higher groups of insects. Some of these micro-organisms float freely in the lymph, and in many cases great numbers of them also fill the plasma of certain fat-cells, thus forming so-called "mycetocytes." The mycetocytes may occur isolated in various parts of the body, or they may be grouped together and even more or less fused into special fungous organs, the "mycetoms." Sometimes micro-organisms of two or even three different kinds live within separate cells of the same host, either quite apart from one another or in compound mycetoms. Typical illustrations of intracellular mycoses are presented by certain hemipterous insects. In particular, all the Homoptera possess such intracellular, hereditary symbionts; their mycetoms are often enclosed within a pigmented epithelium and connected with special branches of the tracheal system of the insect (P. Buchner, 1913).

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[1] *Hormiscium pithyophilum* variety *myrmecophilum* J. B. Elliott (1915, pp. 139–142) is an entirely different fungus, which was found growing on the carton walls of certain nests of *Lasius umbratus* in England (p. 379).

Intracellular symbionts also occur in certain ants, and it is probable that their presence in these insects is more frequent than is known at present. They were first seen by Blochmann (1884, 1888) in *Camponotus herculeanus* subspecies *ligniperdus*, densely filling cells which this investigator regarded as belonging to the epithelium of the intestine. According to Buchner's recent researches (1919) the intracellular organisms of that ant are really contained in special mycetocytes placed in a continuous layer beneath and between the true epithelial cells of the mid-gut. They are present in all individuals in the form of tiny, thread-like bodies, 10 or 12 μ long, generally regarded as bacteria. At the beginning of the sexual maturity of the insect, some of the symbionts leave their mycetocytes, in the worker as well as in the queen. They invade the egg-follicles from all sides and penetrate the egg, the entire plasma of which at first becomes densely filled with bundles of bacteria placed parallel to one another; but, as the egg grows, these organisms are pushed to its posterior pole. Blochmann found similar, but smaller (4 to 5 μ), organisms in *Formica fusca*, where they occupy two groups of cells in the adipose tissue. According to Buchner (1918, p. 77, footnote), intracellular bacteria live in many species of *Camponotus*, such as *C. senex* (F. Smith), *C. maculatus* subspecies *congolensis* Emery, *C. maculatus* subspecies *brutus* (Forel), *C. maculatus* subspecies *atramentarius* Forel, *C. rectangularis* subspecies *rubroniger* Forel, and perhaps in all the members of that genus. But they are absent in many other ants, as, for instance, in *Myrmecina latreillei* Curtis.

2. A REVIEW OF AFRICAN MYRMECOPHYTES

For all practical purposes, ant-plants or myrmecophytes may be briefly defined as plants which during life are continuously inhabited by certain species of ants. This definition, however, calls for certain explanatory remarks which will be found in the introduction to the general review of recorded ant-plants (p. 494). What is known of the ecology of African myrmecophytes has been brought together in the present chapter, in addition to my own field observations. For the convenience of the entomologist, I have compiled from the taxonomic literature the technical descriptions of these plants. To most students they will, I fear, not be much more helpful than they were to me; but descriptive botany seems able to offer nothing better. In themselves, they afford sufficient apology for the fact that in so many cases a correct identification of the plant in question can not be made.[1] It is to be hoped that the absence of a specific name will not render the observations recorded entirely valueless, since more often than not future field workers will be able to recognize the plants by some of the peculiarities shown in the drawings or mentioned in the text.

Being more familiar with the African flora, I may be permitted to call attention to a few general features of myrmecophytism as suggested by a consideration of African ant-plants. Certain of these remarks may also apply to myrmecophytes of other regions, while some perhaps could not be generalized without modification.

(*a*) Though over 30,000 species of flowering plants have been described thus far from the Ethiopian Region, only 42 of them can be regarded as more or less well-defined or probable myrmecophytes. In not more than 20 of these cases have the relations to ants been established from actual observation; for the remaining 22 species myrmecophily is merely surmised from analogy with what is known of their near relatives.[2] In other tropical parts of the world, the number of plants with special accommodations for sheltering ants is somewhat higher (about 116 species in the Neotropical and 109 species in the Indomalayan, Papuan, and Australian Regions), but it must be remembered that their floras are much richer than that of the Ethiopian Region, so that their proportion of myrmecophytes is but little if any higher. The comparatively small number of myrmecophytes is rather surprising considering the abundance and variety of tropical plant life and the many opportunities which ants must have had to become acquainted with it.

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[1] In the case of plants collected by me, numbers are given referring to my herbarium specimens which are now in the hands of Prof. É. De Wildeman, Director of the Brussels Botanical Garden. Some of these specimens have been identified by that authority and their study will undoubtedly be completed in the near future.

[2] Sixteen myrmecophytes are at present known from the Belgian Congo. According to the latest data available, 6372 species of Spermatophyta, belonging to 1261 genera, had been described from that region at the end of 1918 (Goossens, V. 1919. 'Aperçu de nos connaissances actuelles sur la flore du Congo belge.' Bull. Agricole du Congo Belge, X, pp. 154–161).

(*b*) The African myrmecophytes belong to a few taxonomic types, represented by 7 families and 12 genera, as follows:

Leguminosæ	*Schotia*, with 1 species.
Euphorbiaceæ	*Macaranga*, with 2 species.
Sterculiaceæ	*Cola*, with 3 species.
	Scaphopetalum, with 2 species.
Flacourtiaceæ	*Barteria*, with 5 species.
Apocynaceæ	*Epitaberna*, with 1 species.
Verbenaceæ	*Vitex*, with 2 species.
Rubiaceæ	*Uncaria*, with 1 species.
	Sarcocephalus, with 1 species.
	Randia, with 3 species.
	Plectronia, with 6 species.
	Cuviera, with 15 species.

Schotia, *Cola*, *Scaphopetalum*, *Barteria*, *Epitaberna*, and *Cuviera* are precinctive Ethiopian genera, while the others are either also represented in the Oriental and Indomalayan Regions (*Macaranga*, *Sarcocephalus*, *Plectronia*) or tropicopolitan (*Vitex*, *Uncaria*, *Randia*). The family Rubiaceæ leads the list with the largest number of myrmecophilous species (26, belonging to 5 genera), which is true also in other tropical regions. For *Barteria*, *Epitaberna*, and *Cuviera*, myrmecophytism is to all appearances one of the generic peculiarities, probably being present in all the members.

It is a curious fact that in the Ethiopian Region and elsewhere some of the largest families of the vegetable kingdom, in which differentiation into species has been most active, show very few (Leguminosæ, Orchidaceæ) or no cases of myrmecophily. As illustrations of the latter may be mentioned the Gramineæ, Cyperaceæ, Liliaceæ, Labiatæ, and Compositæ.

(*c*) True myrmecophytes are restricted to the sections of the earth situated between the tropics, a fact easily accounted for by the uniform temperature which prevails there and permits ants to establish their perennial abodes within the rather thin walls of plant tissues. I already have shown (p. 371) that the so-called ant acacias of the dry East African plains and *Clerodendron formicarum* of the savannah country are by no means myrmecophytes. When these cases are eliminated, all African ant-plants known at present occur only in the permanently moist and evergreen Rain Forest of the western and equatorial parts of the continent. All the Oriental and Indomalayan and the vast majority of the Neotropical myrmecophytes grow similarly in the moist tropical forest areas.

The one notable exception is presented by the true ant acacias of Central and South America (p. 510), which do not grow in the forests, but only in the open country or savannahs and along road-sides, and in some cases even prefer semiarid regions.

(*d*) The African myrmecophytes are all perennials and of a woody texture, either bushes, low trees, or woody creepers. This also holds true for the ant-plants of southern Asia, Malasia, and tropical America, though the types there are somewhat more varied, including, for instance, typical epiphytes. It is essential to the prosperity of the ant colonies that their permanency be assured for many years, a condition which, of course, could not be provided by annual or biennal plants. In addition, the woody texture of the walls adds considerably to the solidity of the domatia and to the protection of the formicaries. In a number of cases (*Cola, Scaphopetalum*), but not all, the leaves and stems of plants inhabited by ants are abundantly covered with long, stiff hairs.

(*e*) The structures offered as myrmecodomatia by the ant-plants show but little diversity, are usually of a very simple type, and affect few organs of the plant. There is nothing here comparable with the intricacy and endless variety of adaptations presented by entomophilous flowers to pollinating insects. The following types of myrmecodomatia have been recognized in Africa.

1.—The stipules persist for some time and are much swollen, their recurved margins enclosing a pouch-like cavity: *Macaranga saccifera*. A more primitive condition of stipular myrmecodomatia is illustrated by the *Uragoga* described on p. 453.

2.—The leaves produce pouches at the base of the blade: species of *Cola* and *Scaphopetalum*.

Swollen stipules and leaf pouches may be regarded as myrmecodomatia of a very primitive type. They are not much sought by the ants, probably because they do not offer enough solidity and permanency as shelters for formicaries. In the few cases in which I observed ants using the swollen stipules of *Macaranga saccifera* and the foliar pouches of *Cola Laurentii* and *Scaphopetalum Thonneri*, the colonies were very small and the ants timid.

3.—The stems of the plant are externally normal, but hollowed out practically their entire length: *Vitex Staudtii* and *Barteria Dewevrei*.

4.—The stems present fistulose swellings either in the middle of the internodes (*Randia Lujæ* and *R. myrmecophyla*), in, above, or below the nodes (*Uncaria, Sarcocephalus, Plectronia*, and *Cuviera*), or at the base of certain branches (*Barteria fistulosa*).

In other tropical regions there are a number of additional types not yet recognized in Africa, such as stipular thorns (*Acacia*), swollen petioles (*Tachigalia*, *Nepenthes bicalcarata*), pitcher-shaped leaves (*Dischidia*), inflated leaf-sheaths (*Korthalsia*), hollowed pseudobulbs (*Schomburgkia*), and fistulose rhizomes (*Polypodium sinuosum*, *Lecanopteris carnosa*, *Myrmecodia*, etc.)

In the case of stipular or leaf pouches, the slit which leads into the cavity is a natural result of the production of the pouch. In all other African myrmecophytes, there is no preformed entrance to the domatia and the apertures are gnawed by the ants.

(*f*) A very small number of African ants have become adapted to nesting in the domatia of ant-plants. A distinction should be drawn here between OBLIGATORY plant ants, that live exclusively in myrmecophytes, and species which are only occasionally or accidentally associated with these plants and may therefore be designated as FACULTATIVE (Wheeler, 1913, p. 115). Most of the African plant ants fall in the second group; they belong to such genera as *Crematogaster*, *Tetraponera*, *Monomorium*, *Leptothorax*, *Tetramorium*, *Cataulacus*, *Technomyrmex*, and *Prenolepis*, which are abundant in the forest, usually leading an arboreal or semiarboreal life; many of the species make no distinction between cavities of dead or living plants wherein to shelter their formicaries. *Viticicola tessmanni* and the two species of *Pachysima* (*P. æthiops* and *P. latifrons*) are the only African obligatory plant ants. They have never been found away from their hosts, *Vitex Staudtii* in the case of *Viticicola* and various species of *Barteria* and *Epitaberna myrmœcia* in the case of the *Pachysimæ*. It is possible that certain African species of *Engramma* and *Plagiolepis*, which have been collected only in plant domatia, are also of the obligatory type, but their case calls for further investigation.

There are a number of doubtful cases of myrmecophily among African plants and also others that are based on erroneous or incomplete observations. Some of these have been dealt with in the present paper under their respective families or genera, but a few others must be briefly mentioned here for the sake of completeness.

Stereospermum dentatum Richard (Bignoniaceæ), of Abyssinia and Kordofan. According to Penzig (1894) the pith in the upper part of a flowering branch is excavated for a space of one or two internodes and the cavity is inhabited by *Tetraponera penzigi* (Emery), its offspring, and also some coccids. The aperture is found at the tip of what appears to be an aborted limb in the bifurcation of the flowering branch. There are no swellings and the normal stems are filled with pith. Penzig believes that the ants trim the growing upper end of the branch in order to enter the pith and are thus responsible for the dichotomous inflorescence of this species. I am rather inclined to think that the galleries are bored by some insect larva and are only settled by ants after being left by their maker.

Annibale (1907*a*) mentions two other African Bignoniaceæ, *Kigelia africana* (Lamarck) and *Newbouldia lævis* (P. de Beauvois), as "myrmecophilous" because he found nectaria on the under side of the leaves. In addition, herbarium specimens of *Newbouldia lævis* examined by him were hollow in the upper part of the flowering branches, the cavities having one or two apertures at the base. The author assumes that these hollows are natural formations of the plant and are settled by the ants, which pierce the exit holes. He does not state that these insects were actually found in the branches, and the explanation offered above for similar cavities in *Stereospermum* is probably also true here.

Grumilea venosa Hiern (Rubiaceæ). Belgian Congo. "Bush of about 2 m., always inhabited by numerous black ants" (Dewèvre; see De Wildeman and Durand, 1901, p. 130).

Microdesmis puberula J. D. Hooker (Euphorbiaceæ). Belgian Congo. "Ém. Laurent regarded this plant as a myrmecophyte; indeed some of the branches on specimens collected at Bombaie and provided with witch-brooms, are excavated with galleries; but the myrmecophytic character is not much pronounced." (De Wildeman, 1910, 'Études Flore Bas- et Moyen-Congo,' III, 2, p. 250.)

In addition to the ants indicated in the general account of African myrmecophytes which follows, Father Kohl collected at Stanleyville and in nearby localities a number of species "in myrmecophilous plants" which have not been identified thus far in the literature. I subjoin a list of these insects, compiled from Forel's recent paper (1916) on the ants collected in the Belgian Congo by Kohl:

Crematogaster ruspolii variety *atriscapis* (Forel).
C. sjöstedti subspecies *kohliella* (Forel).
C. nigeriensis variety *wilniger* (Forel).
C. kasaiensis (Forel).
C. kohli (Forel).
C. solenopsides subspecies *flavida* variety *convexiclypea* (Forel).
Monomorium oscaris subspecies *springvalense* variety *paternum* Forel.
M. exiguum subspecies *flavescens* Forel.
Leptothorax evelynæ Forel.
Tetramorium simillimum subspecies *isipingense* variety *dumezi* Forel.

Engramma laurenti variety *congolense* Forel.
Prenolepis grisoni Forel.

Leguminosæ

Though this is one of the four or five largest families of plants and contains many of the more common bushes and trees of the tropics, only very few of its members are known to be myrmecophytes. After the elimination of the East African so-called "ant acacias," which, as I have shown elsewhere, do not possess true myrmecodomatia, there remains in Africa only one genus that possibly presents biocœnotic associations with ants.

SCHOTIA Jacquin

Schotia JACQUIN, 1786, 'Collectanea Austriaca ad Botanicam Chemiam et Historiam Naturalem Spectantia,' I, p. 93. OLIVER, 1871, 'Flora of Tropical Africa,' II, p. 309. HARMS, in Engler and Prantl, 1897, 'Die Natürl. Pflanzenfam.,' Nachträge zu III, pt. 3, p. 196.

Theodora MEDIKUS, 1786, 'Theodora speciosa, ein neues Pflanzengeschlecht,' p. 16. TAUBERT, 1894, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 3, p. 138.

"Unarmed trees or shrubs. Leaves abruptly pinnate, with coriaceous often small leaflets; stipules small. Flowers red or purple, clustered in short often dense panicles, heads or racemes. Bracts and bracteoles caducous or subpersistent. Calyx-tube turbinate, campanulate or narrowly infundibuliform; segments 4, much imbricate. Petals 5, slightly unequal, clawed or subsessile, longer or shorter than the calyx, imbricate. Stamens 10, free or shortly coherent below; anthers uniform, dehiscing longitudinally. Ovary stipitate with elongate style and small terminal stigma; ovules 4 to 8 or 10, or more. Legume oblong, often falcate, compressed, coriaceous, dehiscent or subdehiscent. Seeds exalbuminous" (Oliver, 1871).

This genus belongs to the subfamily Cæsalpinioideæ, in which the flowers are not of the papilionaceous type usual in the family, but possess a rather spreading, zygomorphous corolla; in the bud the upper sepals and petals are covered by the lower. *Schotia* is restricted to tropical and southern Africa and contains twelve species, one of which is supposed to be myrmecophytic.

Schotia africana (Baillon)

Humboldtia africana BAILLON, 1870, 'Histoire des Plantes,' II, p. 99, footnote (Tropical West Africa).

Schotia humboldtioides OLIVER, 1871, 'Flora of Tropical Africa,' II, p. 310. HARMS, 1915, in Engler, 'Die Pflanzenwelt Afrikas,' III, pt. 1, p. 454, fig. 249.

Theodora africana (Baillon) TAUBERT, in Engler and Prantl, 1894, 'Die Natürl. Pflanzenfam.,' III, pt. 3, p. 138.

"A glabrous tree of 25 to 30 feet; extremities (in our specimens) tumid immediately under each node, narrowing gradually nearly to the middle of the internode. Leaves ½ to 1 ft. long, 2- to 4-jugate, glabrous; leaflets thinly coriaceous, the lowest pair near the base of the leaf, obliquely elliptic-oblong, narrowly acuminate, base very oblique rounded; $4\frac{1}{2}$ to 6 in. long, $1\frac{3}{4}$ to $2\frac{1}{3}$ broad; petiolule 0 to 1 line. Racemes solitary, or 2 or 3 from the axils, $1\frac{1}{2}$ to 2 in. long, densely many-flowered. Bracteoles broadly ovate, about $\frac{1}{2}$ line long. Flowers patent, on pedicels of about 1 line. Calyx $\frac{2}{3}$ to $\frac{3}{4}$ in. long, puberulous or glabrate, the tube but slightly exceeding the limb. Petals oval or ob-lanceolate narrowed at base, slightly longer than calyx-lobes. Filaments glabrous, very shortly unequally coherent at the base. Ovary and gynophore pilose; ovules 4 to 5. Legume unknown.

"This plant so much resembles species of the Indian genus *Humboldtia*, that in the 'Genera Plantarum' (of Bentham and Hooker) it is referred to as an African species of that genus. Except in the long narrow calyx-tube and fewer ovules, I do not find any technical character of importance to distinguish it from the other *Schotia*. The minute bracteoles, which persist until flowering, do not enclose the young bud" (Oliver, 1871).

Cameroon: River Cameroon (Mann).

According to Harms (1915), who figures the swellings, *Schotia africana* is a tree of the Rain Forest of Cameroon, Spanish Guinea and Gaboon; the internodes of young branches are often swollen towards the upper node and hollow inside. The wall is pierced with a hole through which ants gain access to the inner cavity. This supposed myrmecophyte should be carefully studied in the field. Though having all the appearances of myrmecodomatia, its swellings may still be mere insect galls inhabited by ants after being left by their makers, as is so often the case in the tropics.

Euphorbiaceæ

MACARANGA DuPetit-Thouars

Macaranga DuPETIT-THOUARS, 1806, 'Gen. Nov. Madagascariensia,' p. 26. PAX, 1890, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 5, p. 59. PRAIN, 1912, in Thiselton-Dyer, 'Flora of Tropical Africa,' VI, 1, p. 932. PAX, 1914, 'Das Pflanzenreich,' IV, pt. 147, VII, p. 298.

Trees or shrubs. Leaves alternate, petiolate, simple or lobed; their base often palminerved and sometimes peltate, occasionally penninerved. Spikes or racemes axillary or lateral or sometimes forming a terminal panicle. Flowers diœcious, rarely monœcious, apetalous. Male flowers small, clustered. Female flowers solitary. Bracts distinct or minute, entire or lobed or fimbriate. Male flower: calyx globose, closed in bud, splitting into 3- to 4-valvate lobes; stamens sometimes few (1 to 3), often numerous (10 to 30); filaments short, free, very rarely united or as if branched; anthers short, terminal, usually 4-celled, 4-valved, sometimes 3-celled, 3-valved, rarely 2-celled; no rudimentary ovary. Female flower: calyx truncate or shortly toothed, ultimately wide-cupular or obliquely spathaceous; ovary 2- to 3- (rarely 4- to 6-) celled; styles short, stout, entire, free or slightly united at the base, rarely long, slender or united in a globose mass; ovules in each cell solitary. No disk. Capsule breaking up into 2-valved cocci or occasionally, when 1-chambered, almost indehiscent. Seeds globose; testa crustaceous; albumen fleshy; cotyledons broad, flat. (After Prain, 1912.)

The genus *Macaranga* includes over 170 species of trees and shrubs distributed in Africa and its islands, Indomalaya, and the Australian and Polynesian Regions. Some forty species have been described from Tropical and South Africa, fourteen of which are recorded from the Belgian Congo. It is probable that a number of the African species are more or less associated with ants, since several of the Indomalayan forms exhibit various mutualistic relations with these insects. Ridley is even inclined to believe that in some species of this genus symbiosis of the ants and the plant appears to be as complete as possible (see p. 516).

Two of the African species, *M. saccifera* Pax and *M. Schweinfurthii* Pax, have persistent pouch-like stipules which are occasionally occupied by ants. Ém. Laurent noticed that in another species, *M. dibeleensis* É. De Wildeman,[1] the leaves attract ants, probably by means of the nectaries at the base of the blade; the stipules are more or less concave, not at all pouch-like, and soon deciduous, so that this species probably is not a true myrmecophyte.

Macaranga saccifera Pax

Macaranga saccifera Pax, 1894, Engler's Bot. Jahrb., XIX, p. 93, Pl. I. Th. Durand and H. Schinz, 1896, Mém. Couronnés Ac. Roy. Belgique, LIII, 4, p. 246. É. De Wildeman and Th. Durand, 1900, 'Contributions Flore du Congo,' II, p. 57; 1901, 'Reliquiæ Dewevreanæ,' p. 212. É. De Wildeman, 1905, 'Mission Émile Laurent,' fasc. 2, p. 130, Pls. XXXIX–XLI; 1908, 'Études Flore Bas- et Moyen-Congo,' II, 3, p. 283. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 496. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 149. É. De Wildeman, 1910, 'Compagnie Kasai, Miss. Perm. Ét. Scient.,' p. 330. Engler, 1910, 'Die Pflanzenwelt Afrikas,' I, p. 644, fig. 555. Prain, 1912, in Thiselton-Dyer, 'Flora of Tropical Africa,' VI, 1, p. 934. Pax, 1914, 'Das Pflanzenreich,' IV, pt. 147, VII, p. 312, fig. 51. É. De Wildeman, 1919, C. R. Ac. Sci. Paris, CLXIX, p. 394.

"A shrub or tree; branches armed with spines, densely tawny-pubescent. Leaves long-petiolate, rounded-ovate, deeply 3-lobed; lobes obovate-oblong or triangular, acute; margin repand or toothed; base narrowly deep-cordate; 8 to 10 in. long, nearly as wide, subcoriaceous, gland-dotted beneath, with a pair of marginal glandular processes at the junction with the petiole; petiole 6 in. long; stipules converted into large coriaceous acute flask-shaped sacs. Male flowers in axillary panicles; bracts ovate, acute, subtending several flowers, buds globose. Female flowers unknown" (Prain, 1912).

Pax (1914) distinguishes two forms:

Variety *α. genuina* Pax and K. Hoffmann, 1914, 'Das Pflanzenreich,' IV, pt. 147, VII, p. 312, fig. 51.

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[1] Described by De Wildeman, 1908, in 'Études Flore Bas- et Moyen-Congo,' II, pt. 3, p. 281. See also H. Kohl, 1909, p. 150.

"Leaves rather densely glandular underneath. Rachis sparsely pilose; young bracts densely imbricate, almost entire."

French Congo: Libreville (Klaine).

Belgian Congo: Lower Congo: in the Cataract District between Matadi and Leopoldville (Laurent). Kwango: Madibi (Sapin). Kasai: Mukenge (Pogge); Kondué; Batempa; between Lusambo and the Lomami River (Ém. and M. Laurent). Upper Congo: Eala (Pynaert; M. Laurent); Bokakata (Dewèvre); Bumba (Seret); Injolo (Seret; M. Laurent). Eastern Congo Forest: Patalongo near Yambuya (M. Laurent); Panga (December 19, 1913; J. Bequaert; Coll. No. 1552); in the forest between Walikale and Lubutu (village of Mosekowa, January 21, 1915; J. Bequaert; Coll. No. 6700).

Variety β. *dentifera* Pax and K. Hoffmann, 1914, 'Das Pflanzenreich,' IV, pt. 147, VII, p. 313.

"Leaves sparsely glandular underneath. Rachis pubescent; bracts more loosely imbricate, denticulate."

Cameroon: Lomie (village of Bumba); Molundu (Mildbraed).

Macaranga Schweinfurthii Pax

Macaranga Schweinfurthii PAX, 1894, Engler's Bot. Jahrb., XIX, p. 92. TH. DURAND AND H. SCHINZ, 1896, Mém. Couronnés Ac. Roy. Belgique, LIII, 4, p. 246. TH. AND H. DURAND, 1909, 'Sylloge Flor. Congol.,' p. 496. PRAIN, 1912, in Thiselton-Dyer, 'Flora of Tropical Africa,' VI, 1, p. 935. PAX, 1914, 'Das Pflanzenreich,' IV, pt. 147, VII, p. 313.

Macaranga rosea PAX, 1899, Engler's Bot. Jahrb., XXVI, p. 328. É. DE WILDEMAN, 1908, 'Études Flore Bas- et Moyen-Congo,' II, 3, p. 283. TH. AND H. DURAND, 1909, 'Sylloge Flor. Congol.,' p. 496. PRAIN, 1912, in Thiselton-Dyer, 'Flora of Tropical Africa,' VI, 1, p. 935. MILDBRAED, 1912, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' II, p. 456.

Macaranga Lecomtei BEILLE, 1908, Bull. Soc. Bot. France, LV, Mém., 8, p. 78.

Macaranga calophylla PAX, 1909, Engler's Bot. Jahrb., XLIII, p. 221.[1]

"A shrub or tree, sometimes very lofty, reaching 150 feet in height (Chevalier); trunk and branches armed with spines, branches glabrous. Leaves long-petiolate, ovate, shallowly 3-lobed; lobes oblong or triangular, acute; margin irregularly toothed; base narrowly deep-cordate; 6 to 18 in. long, nearly as wide, membranous, becoming firmer with age, gland-dotted beneath, with a pair of glandular processes at the junction with the petiole; petiole 8 to 16 in. long; stipules large, ovate, acute, $1\frac{3}{4}$ in. long. Male flowers in lateral panicles fascicled in the axils of fallen leaves; bracts concave, thick, entire, subtending many flowers. Stamens 2 to 5 (usually 3). Female flowers in short lateral racemes; pedicels short, stout. Sepals ovate, obtuse. Ovary glabrous, 2- to 3-celled; stigmas spreading. Capsule usually 2-coccous; cocci $\frac{1}{2}$ in. across" (Prain, 1912).

French Sudan: Darbanda in the Boro Valley (Chevalier).

Southern Nigeria: Oban (Talbot).

Cameroon: Tibati; Songalong (Ledermann); Bipindi (Zenker); Johann-Albrechtshöhe (Büsgen).

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[1] The synonymy accepted here is from Pax's recent monograph of the Euphorbiaceæ (1914).

French Congo: Brazzaville (Chevalier).

Belgian Congo: Upper Congo: Eala (Pynaert); Ikenge (Huyghe). Kasai: Mukenge (Pogge). North-eastern Congo: Beni (Mildbraed); Mangbetu Country at Munza's (Schweinfurth).

Angola: Bamba (Monteiro); Ambriz (Welwitsch).

Anglo-Egyptian Sudan: Niam Niam Country near the river Diagbe and near the river Djur (Schweinfurth).

Uganda: very common (Scott-Elliot; Bagshawe).

Prain still thinks that *M. rosea* differs from *M. Schweinfurthii* in the shape of the basal sinus of the leaf, which is open in the former and narrow in the latter; Pax (1914), however, believes that both are forms of the same species.

According to Pax (1914), the stipules of *M. Schweinfurthii* are persistent, 3 to 5 cm. long, 2 to 3 cm. broad, slightly saccate at the base, obliquely inserted, acuminate, membranous, glabrous, shortly connate at the base. It is quite possible that, although much less pouch-like than in *M. saccifera*, they may occasionally be occupied by ants, though this has never been observed.

ECOLOGY OF *Macaranga saccifera*

This species is one of the common elements of the undergrowth in the Rain Forest of the Congo, in the eastern district of which I frequently observed it. Growing preferably in low-lying, rather swampy portions of primary forest, it is often found along the banks of rivers or at the edge of brooks. All the specimens I saw were low bushes, rarely over three feet high and generally smaller. Since, however, none of them were in flower or with fruit, they may have been juvenile or dwarfed. The very conspicuous, persistent stipules, placed in pairs at the base of the petiole, are always much swollen, saccate or flask-shaped, about 1 to 3 cm. long, and end in a curved, acuminate apex (Fig. 83). Their texture is more or less coriaceous and hispid hairs are scattered over the outer surface. In each stipule the free, lateral margins are curved close to each other, leaving a very narrow, upper slit as entrance to the pouch. At the foot of the leaf-blade occur two folds, one on either side of the petiole, covering nectaries which I have seen visited by ants. De Wildeman formerly supposed that these folds might shelter mites or even be myrmecodomatia, but I doubt whether such is the case.

That the stipular pouches of *Macaranga saccifera* were occasionally used by ants was merely surmised by Pax on account of the analogy of these organs with similar structures of other myrmecophytes. É. Laurent, however, found ants inside the pouches of the specimens which he collected in the Kasai District, Belgian Congo, and this observation

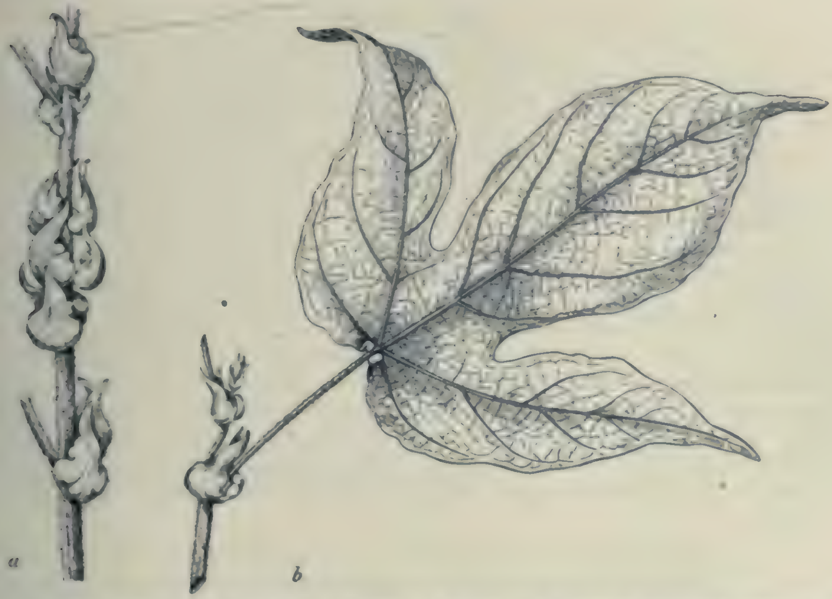

Fig. 83. *Macaranga saccifera* Pax: *a*, portion of branch with pouch-like stipules; *b*, extremity of branch with stipules and a leaf seen from above showing the two folds at base of blade. About one-half natural size (after De Wildeman, 1905).

has quite recently been confirmed for my herbarium plants by É. De Wildeman (1919*b*) who, moreover, points out that *M. saccifera* shelters ants only under certain circumstances. The latter author also mentions that *M. saccifera* has been cultivated for several years at the Brussels Botanical Garden, where it still continues to produce its saccate pouches though these are never utilized by ants.

On only one occasion have I found ants inside the stipular pouches of this plant. Near the village of Mosekowa, between Walikale and Lubutu, in January 1915, a few specimens of *Crematogaster* (*Atopogyne*) *africana* subspecies *tibialis* Santschi occupied some of the stipules. In each case the upper slit leading inside the pouches was not closed with fibres or carton, and no coccids were found with the ants. Since no young or pupæ were present, these pouches can not be regarded as the real nest of the ants, but merely as temporary shelters or annexes. In my opinion, this plant belongs to a very primitive stage of myrmecophily, when compared with some of the other African ant-plants. For this very reason, however, its relations to the ants deserve to be more fully investigated.

Sterculiaceæ

Cola Schott and Endlicher

Cola Schott and Endlicher, 1832, 'Meletemata Botanica,' p. 33. Masters, 1868, in Oliver, 'Flora of Tropical Africa,' I, p. 220. K. Schumann, 1895, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 6, p. 99; 1900, 'Sterculiaceæ Africanæ,' in Engler, 'Monogr. Afrik. Pflanzenfam.,' V, p. 110.[1]

Edwardia Rafinesque, 1814, Spechio delle Scienze, Palermo, I, p. 158 (not *Edwardsia* Salisbury, 1808).

Lunanea A. de Candolle, 1825, 'Prodromus Regn. Veget.,' II, p. 92.

Trees, shrubs or bushes. Leaves entire or lobed, often polymorph, rarely digitate; glabrous, hairy or scaly. Flowers in axillary panicles or clusters, sometimes out of the old wood. Flowers through abortion unisexual or polygamous. Calyx cup-shaped or campanulate, 4- or 5-cleft. Petals absent. Staminal column sometimes very short, bearing at the top a ring of 10 to 12 anthers, disposed in one or two, regular rows; anther-cells (thecæ) parallel or superposed. Ovary 3- to 10-celled, with as many styles as cells. Ovules numerous in each cell. Fruit of 4 or 5 leathery or woody oblong carpels, ultimately splitting lengthwise. Seeds numerous, obovoid, exalbuminous; cotyledons thick, sometimes deeply bifid; radicle next to the hilum. (After K. Schumann.)

This large genus is restricted to the continental part of the Ethiopian Region. About one hundred species have been described, most of which grow in that portion of Africa defined by Engler as the "Western Forest Province" and twenty-five of them occur in the Belgian Congo. A few very closely allied forms possess at the base of the leaf-blade a pair of small pouches which are occasionally inhabited by ants. In addition, these myrmecophilous species differ from their relatives in having branches and leaves covered with numerous long, stiff, erect hairs of a brown or brownish red color; the other members of the genus being glabrous.

Cola Dewevrei De Wildeman and Durand

Cola Dewevrei É. De Wildeman and Th. Durand, 1899, Bull. Soc. Bot. Belgique, XXXVIII, 2, p. 184; 1901, 'Reliquiæ Dewevreanæ,' p. 24. É. De Wildeman, 1907, 'Mission Émile Laurent,' fasc. 4, p. 406, Pl. cxxvii. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 62. É. De Wildeman, 1920, 'Mission de Briey au Mayumbe,' p. 191.

"A low shrub, 1 to 2 m. high. Branches hollow, terete, with long pilosity. Leaves trilobate, deeply cordate at the base, abruptly acuminate at the apex, shiny on upper and under sides, pilose, especially on the veins. Secondary veins arcuately anastomosing toward the margin and uniting with the reticulate finer venation, a little prominent above, more strongly so below. Petiole very long, more or less grooved above, with long pilosity, 6 to 32 cm. long. Leaves 13 to 25 cm. long and 15 to 24 cm. broad. Stipules linear-lanceolate, dropping, pilose, about 6 to 11 mm. long and 1 to 1.5 mm. broad. Flowers yellow, fasciculate, axillary, subsessile, bracteate. Calyx

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[1] According to the rules of botanical nomenclature the name *Cola* should be replaced, it seems, either by *Edwardia* or by *Lunanea*, since the latter two are not preoccupied and evidently have priority.

5-lobed, ferruginous tomentose externally, brown and less pilose inside, about 11 mm. long; its lobes 2 to 3 mm. long, acute, with more or less reflexed tips. Andrœcium of the male flowers stipitate, smaller than the calyx, with subglabrous stipe, 4 mm. long; the anthers placed close together, parallel and united into a ring which is about 1.5 mm. high" (De Wildeman and Durand, 1899).

Belgian Congo: Mayombe: Lemba River (Dewèvre).

It would seem from the descriptions that the later *C. Laurentii* De Wildeman and the earlier *C. marsupium* K. Schumann are not specifically distinct from *C. Dewevrei*. According to De Wildeman (1907, p. 406), the leaves of *C. Dewevrei* have a different shape from those of *C. Laurentii*, with basal lobes almost touching each other. In these *Colæ*, however, the form of the leaves varies to such an extent even on the same plant that this character is by itself unsatisfactory for the distinction of the species. The existence of foliar pouches is not mentioned in the original description of *C. Dewevrei*, but De Wildeman's figures of that species published in 1907 show them distinctly.

Cola Laurentii De Wildeman

Cola Laurentii É. De Wildeman, 1907, 'Mission Émile Laurent,' fasc. 4, p. 403, fig. 68, Pls. cxxxv, cxxxvi, and cxxxvii; 1908, 'Études Flore Bas- et Moyen-Congo,' II, 3, p. 304. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 63. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 148. A. Engler, 1912, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' II, p. 506. É. De Wildeman, 1919, Bull. Jard. Bot. Bruxelles, V, p. 358.

"A small tree with cylindric branches densely villose; with brownish, elongate, spreading hairs which drop late. Leaves with more or less lengthened petioles, which are cylindrical, hispid with spreading hairs, 5 to 35 cm. long. Leaf-blade 3-lobed or nearly 5-lobed, cordate at the base; the midlobe about two thirds the length of the leaf, which varies from 11 to 36 cm.; the midlobe is oblong, rather suddenly acuminate at the tip, acute; lateral lobes about of the same shape, a little shorter and narrower than the terminal lobe, which reaches a length of 23 cm. and a width of 13.5 cm. Leaf-blade paler on the under than the upper side or about the same color, with 7 basal veins, the lateral ones often united at the base. Leaf-blade coriaceous, glabrous, except on the veins of both sides, especially on those of the under side which are very prominent and bristling with stiff hairs. Between the midrib and the first lateral vein on each side of it there is a small pouch strongly projecting on the upper side; the two veins between which this pouch is formed are united at the base by a plate of tissue. Stipules filiform, hispid, rather dropping, about 2 cm. long, acute. Flowers fasciculate at the axils of the leaves; the rachis about 1 cm. long; the bracts linear, acuminate, hispid, about 2 mm. long; the pedicels villose, a little over 1 mm. long. Calyx campanulate, about 8 mm. long; with 4 to 5 lobes one-third the length of the tube; calyx densely villose, brownish on the outer side, with more scattered hairs internally. Male flowers with an uniseriate andrœcium, composed of thecæ a little over 2 mm. long, borne on a slender, feebly elevated androgynophore which is 3 to 4 mm. long and shorter than the calyx-tube. Female flower with a densely villose, ovoid ovary; the style shorter than the ovary, with spreading stigmata which are as long as the calyx-tube. Staminodes reduced, surrounding the base of the ovary. Fruits red, 5 to 6 cm. long including the acumen, with 4 to 5 seeds" (De Wildeman, 1907).

Belgian Congo: Lower Congo: Sabuka (M. Laurent); between Boma and Yanga (R. Verschueren). Kasai: Dibele; Kondué (Ém. and M. Laurent); forest of the Sankuru (Luja). Upper Congo: Eala; Yakusu (Ém. and M. Laurent); Yambinga (M. Laurent); Dundusana (F. Reygaert); Barumbu (November 3, 1913; J. Bequaert; Coll. No. 1081). Eastern Congo Forest: Yambuya (M. Laurent); Basoko (Ém. and M. Laurent); Fariala between Mawambi and Avakubi (f. *integrifolia;* Mildbraed); between Lubutu and Kirundu (village of Uchibango, February 1, 1915; J. Bequaert; Coll. No. 6790); Stanleyville (March 1915; H. Lang).

De Wildeman classified as "form *intermedia*" plants of this species in which entire and trilobed leaves are found on the same branch together with all intermediate shapes; his "form *integrifolia*" includes specimens in which all the leaves are entire, ovate-cordate at the base and as much as 35 cm. long and 18 cm. broad; in this last form pouches are also feebly developed along the midrib in the axils of the first or first and second lateral veins, above the large basal pouches.

In recording the form *integrifolia*, Engler (1912, p. 506) also mentions that in his opinion *C. Laurentii* is not specifically distinct from *C. marsupium*.

Cola marsupium K. Schumann

Cola marsupium K. Schumann, 1891, Ber. Deutsch. Bot. Ges., IX, pp. 68-70; 1900, 'Sterculiaceæ Africanæ,' in Engler, 'Monogr. Afrik. Pflanzenfam.,' V, p. 113, Pl. XII, figs. A-D. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 148.

"A shrub or tree, with slender, terete branches, the younger ones flattened and strongly hispid, later glabrescent. Leaves with long, terete, hispid petioles; oblong or obovate-oblong, shortly and very sharply acuminate, cordate at the base; with 7 or even 9 veins; provided with a pair of pouches forming basal swollen domatia between the midrib and the lateral veins; covered with rather long hairs on the veins on both sides, rather rigidly herbaceous. Stipules filiform, hispid, persistent for a long time. Flowers short pedicellate, axillary, fasciculate, placed either at the extremity of branches which are rather sparsely leaved below or on leafless branches. Bracts and bracteoles linear, acuminate, hispid. Calyx campanulate; its upper third split into 4 or 5 ovate, acute lobes; tomentose outside, papillate inside. Male flower: andrœcium uniseriate of 16 to 20 thecæ, raised on a gracile, glabrous column. Female flower: ovary subglobose, pentamerous,tomentose; the style glabrous, straight, 5-lobed; 8 ovules in each cell; follicles short stipitate, fusiform.

"The shrub reaches a height of 1 to 2.5 m.; the tree as much as 10 m. The foliate, flowering branches are 3 to 3.5 mm. thick at the base and 20 to 25 cm. long; they are rough, being covered with simple, spreading, brown red or brown hairs, which are thickened into a tubercle at the base. The petiole is 1.5 to 15 cm. long and covered with the same pile. The blade has a length of 6 to 30 cm. and a width of 3 to 13 cm.

above the middle; in addition to the basal veins, it is crossed on each side of the midrib by only 5 to 6 stronger veins, which are a little more prominent on the under side, as is also the reticulate venation; sometimes the blade is somewhat gibbous; in life it is dark green, brownish green when dry. The basal pouches can be entered from the under side; they are not always present, but usually found on the larger leaves. The stipules are 1 to 1.5 cm. long and covered with brown hair. The bracts of the flowers are usually somewhat broader than the stipules, but otherwise similar. The yellowish green calyx is 5 to 7 mm. long. Male flower: andrœcium 1.5 mm. long, as well as the androgynophore. Female flower: calyx slightly larger; ovary 6.5 mm. long, surrounded at the base by a ring of staminodes 2 mm. high. The fruit is red, but perhaps not entirely ripe" (K. Schumann, 1900).

Cameroon: Abo (Buchholz); Johann-Albrechtshöhe: in the Senge Mountains (Staudt).

French Congo: Maveli Mountains near the Sibange Farm (Dinklage).

It seems probable that the three forms described above, *C. Dewevrei*, *C. Laurentii*, and *C. marsupium*, all belong to one species, for which the name *C. marsupium* K. Schumann should be retained. This is, however, a question to be decided by botanists and, in order to avoid any possible confusion, I have here used the name *C. Laurentii* for the plants observed by me in the Belgian Congo, because the description of that species fits them most nearly.

Ecology of *Cola Laurentii*

This plant is rather common in the Congo Basin, where it prefers the drier, more elevated parts of the primitive Rain Forest. It usually grows as a shrub of moderate size (1 to 2.5 m. high), more rarely as a small tree (as much as 10 m. high) and flowers in both forms. The leaves are, as mentioned above, of variable size and shape, usually elongate-oval, with cordate base; the margin may be entire, or slightly or deeply lobate. The pair of basal, elongate-oval pouches on the leaves are more or less developed; wholly absent in certain cases, in others they may attain 15 mm. in length and 5 mm. in width; on the average they are 4.5 to 9 mm. long, 1.5 to 4 mm. broad and 6 mm. high. Placed at the base of the blade close to the midrib, they project on the upper side of the leaf and on the under side have a narrow slit their entire length.

The general aspect of *C. Laurentii* is illustrated on Plate XXVII, Figure 2, by a photograph of a branch, with flowers and fruit, made by Mr. H. Lang at Stanleyville, while the shape of the myrmecodomatia is seen in Text Figure 84. As mentioned by Ém. Laurent (De Wildeman, 1907, p. 405), the pouches are only occasionally occupied by ants. They were empty on most of the many plants which I examined. On one occasion, near the village of Uchibango, between Lubutu and Kirundu (February 1915), ants belonging to the dolichoderine *Engramma kohli*

Forel were found inside the pouches; they had closed the slit at the under side with vegetable detritus. Unidentified ants were also found in such swellings at Barumbu (November 1913). Some of the plants collected by Mr. H. Lang along the Tshopo River near Stanleyville, in March 1915, were inhabited by *Plagiolepis mediorufa* (Forel), an ant originally described from specimens taken by Father Kohl in a nearby locality from an unidentified myrmecophilous plant. *Engramma kohli*, like certain other members of the genus, is a frequent inhabitant of various myrmecophytes. Both *Engramma* and *Plagiolepis* are so timid and small that they could not well act as body-guards to their host plant.

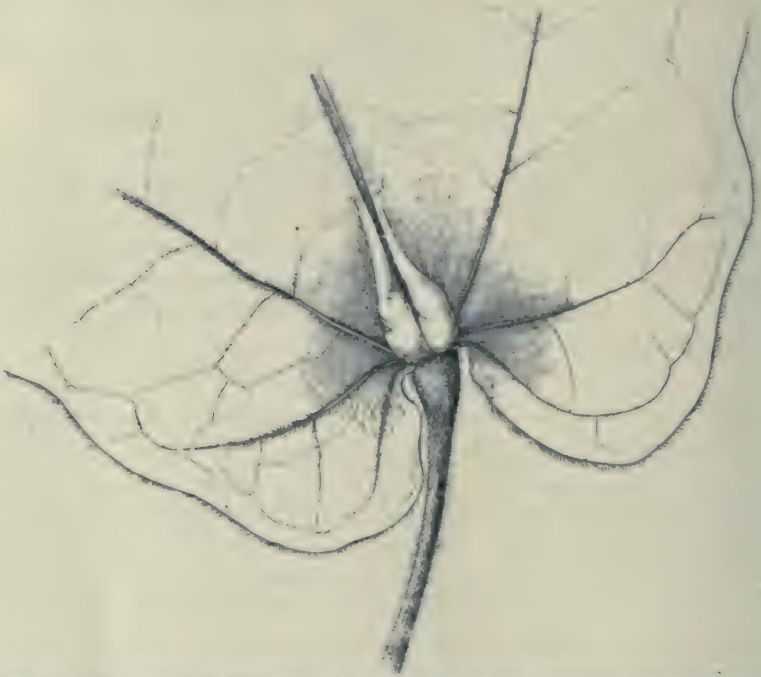

Fig. 84. *Cola Laurentii* De Wildeman. Lower part of a leaf seen from above, with the two pouches at base of blade. Drawn from life at Barumbu, November 1913. About natural size.

Although K. Schumann (1891, pp. 68–70) describes the ascidia of *Cola marsupium* very fully and regards them as myrmecodomatia, he was unable to find ants on his herbarium specimens from Gaboon and Cameroon. H. Kohl (1909, p. 148) is inclined to believe that, on account of the small size, these pouches are not adapted to the use of ants but serve better as shelters for coccids or plant lice.

SCAPHOPETALUM Masters

Scaphopetalum Masters, 1867, Journ. Linn. Soc. London, Botany, X, p. 27; 1868, in Oliver, 'Flora of Tropical Africa,' I, p. 236. K. Schumann, 1895, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 6, p. 86; 1900, 'Sterculiaceæ Africanæ,' in Engler, 'Monogr. Afrik. Pflanzenfam.,' V, p. 90.

Shrubs with petiolate, oblong, entire, unicostate, glabrous leaves. Flowers yellow or yellowish-green, pedunculate, placed in cymes or clusters, axillary or emerging from the trunk or older branches. Calyx of 5 valvate sepals, more or less coherent, sometimes forming a 2-valved calyx. Petals 5, hooded, nervose-striate, without appendages or laminæ. Filaments united into an angular, funnel-shaped, membranous tube, which bears at the upper margin 5 roundish reflexed staminodes alternating with the sepals; anthers in phalanges of 3 between the staminodes, more or less concealed within the concavity of the petals, 2-lobed and 5-celled; ovules either numerous, arranged in two rows on the inner angle of each cell, or few, two or four above one another in one or two rows. Styles connate. Stigma obsoletely 5-lobed, capitate. Fruit a capsule with feebly fleshy walls, loculicidal. Seed, as far as known, with a curled arillus. Cotyledons flattened, foliaceous in the albumen.

This small genus contains eight described species and is peculiar to the Western Forest Province of the Ethiopian Region, from Cameroon and Gaboon to the Upper Congo. The two myrmecophytic species are the only members of the genus which have thus far been recorded from the Belgian Congo. They have been placed by K. Schumann in a section of their own, whose characters are as follows.

Section *Physcophyllum* K. Schumann. Ovules few in number, from 2 to 4 in each cell of the ovary, placed in one or two rows. Upper side of the leaves with an elongate, spindle-shaped pouch at the base of the blade on one side of the midrib. Flowers small; calyx-lobes with soft hair (after De Wildeman and Durand).

Contains only two species which have been separated thus:

Leaves oblong-lanceolate. Fruit not as high as broad, with 5 very distinct cells, which are rounded at the back and end in a pointed tip; two seeds in each cell.
S. Thonneri De Wildeman and Durand.

Leaves obovate, narrowed towards the base. Fruit higher than broad, with 5 very distinct cells, which are subangulate at the back and taper gradually towards an erect, feebly pointed apex; four seeds in each cell.
S. Dewevrei De Wildeman and Durand.

Scaphopetalum Dewevrei De Wildeman and Durand

Scaphopetalum Dewevrei É. De Wildeman and Th. Durand, 1901, Bull. Soc. Bot. Belgique, XXXIX, 2, p. 97; 1901, 'Reliquiæ Dewevreanæ,' p. 26. É. De Wildeman, 1905, 'Études Flore Bas- et Moyen-Congo,' I, p. 167. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 66. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 111.

Scaphopetalum Thonneri É. De Wildeman and Th. Durand, 1898, 'Illustrations Flore du Congo,' I, pp. 13–14 (*pro parte*), Pl. vii; 1900, 'Plantæ Thonnerianæ Congolenses,' p. 26 (*pro parte*), Pl. xix.

"Shrub about 2 m. high, covered with brown pile towards the apex of the branches, the stem otherwise glabrous. Leaves alternate, obovate, subcordate at the base, abruptly and sharply acuminate at the apex, entire; greenish-gray above, greenish-brown below, subcoriaceous, not shiny above; glabrous or sparsely pilose near the veins; 14 to 20 cm. long, 4.5 to 6.5 cm. broad beneath the apex, about 2 cm. broad near the base; petiolate, the petiole 5 to 6 mm. long, thick, silky. Leaves asymmetric, unilaterally constricted towards the base, which bears on the upper side a small pouch acuminate towards its tip and opening below in the axil of the penultimate lateral vein. On each side of the midrib there are about 8 lateral veins, projecting slightly on the upper, more strongly on the under side and arcuately anastomosing before the margin; a conspicuous, dense network of anastomosing venules. The basal lateral vein and the midrib nearly meet on one side of the leaf, and unite by a secondary vein, enclosing thus the opening of the pouch. Stipules subulate, more or less persisting, 5 to 12 mm. long, fasciculate, each cluster 10 to 20 mm. long, branched, axillary, pedicellate, the pedicel 5 to 7 mm. long, bracteate; the bracts subulate, ciliate. Sepals 5, free almost to the base, oblong, velutinous externally, more or less keeled, with three veins. Petals 5, subequal with the sepals, oblong, with recurved apex, hood-shaped, longitudinally striate. Tube of the stamens membranous, pentagonal, salver-shaped, with 5 fertile edges, the intervening lobes sterile; the fertile lobes opposite the petals. Petals covering the stamens in the bud; thecæ six for each phalange; the thecæ subsessile; sterile lobes briefly tridentate, the median tooth obtuse, the lateral teeth narrow. Ovary oblong, 5-celled. Style entire, erect or slightly curved at the apex. Fruit red, stellate, 7 mm. long and about 3.5 mm. broad, with a prominent, horned apex; it is divided into 5 distinct cells, each of which contains 4 seeds, inserted on a central placenta.

"Differs from *S. Thonneri* in the leaves and fruit, and in the number of ovules or seeds contained in each of the cells of the ovary or fruit" (De Wildeman and Durand, 1901).

Belgian Congo: Eastern Congo Forest: forest at Matchacha (Dewèvre).[1] Kasai: Kondué (Luja).

Dewèvre wrote the following field-notes for his specimens: "calyx green; corolla orange-yellow with red stripes; coronula (or stamen-tube) with red edges; anthers brown; the leaves have at the base a fold inhabited by numerous red-brown ants with black abdomen." Luja found *Engramma lujæ* Forel in the pouches of *S. Dewevrei* at Kondué.

Scaphopetalum Thonneri De Wildeman and Durand

Scaphopetalum Thonneri É. De Wildeman and Th. Durand, 1897, Bulletin de l'Herbier Boissier, V, June, p. 521, Pl. xxi; 1901, Bull. Soc. Bot. Belgique, XXXIX, 2, p. 96. É. De Wildeman, 1907, 'Mission Émile Laurent,' fasc. 4, pp. 400–402, figs. 66 and 67, Pls. cxli and cxlii; 1907, ibid., fasc. 5, p. cexxiv, fig. xii. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 66. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 110, Pl. i. A. Engler, 1912, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' II, p. 503. É. De Wildeman, 1919, Bull. Jard. Bot. Bruxelles, V, p. 356.

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[1] To judge from Dewèvre's itinerary, this locality is situated on the banks of the Congo River (Lualaba) between Ponthierville and Nyangwe; I have not found it on any map.

Scaphopetalum monophysca K. Schumann, 1897, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' Nachträge z. I–IV, October, p. 247, without description; 1900, 'Sterculiaceæ Africanæ,' in Engler, 'Monogr. Afrik. Pflanzenfam.,' V, p. 93, Pl. VII, Fig. A, *a–i*.

"Shrub, 2 m. high. Petioles short, 6 to 8 mm. long, villose, shorter than the stipules. Stipules subulate, with well-marked, parallel veins, sometimes deciduous. Extremities of the branches covered with erect brown hairs. Leaves alternate, oblong, acuminate, entire, green, shiny on the upper face, coriaceous, glabrous except along the midrib on the upper face, where the pilosity of the petiole extends upwards, but is less distinct. Leaves 9 to 23 cm. long, 2.5 to 7.5 cm. wide, narrowed towards the base, asymmetric; the right half of the leaves placed on the right side of the branch, and the left half on the left side. Lateral veins pennate. Upper face of the leaves showing on the narrowest half a basal pouch-shaped fold which opens on the under side near the midrib. Veins of the under side asymmetric; the first lateral vein on either the right or the left half, instead of leaving the midrib almost at a right angle, makes a very acute angle and, at 20 to 25 mm. from its base, unites with the second lateral vein close to the midrib by means of a veinlet. The opening of the pouch is placed between the midrib and this first lateral vein, and is thus not a pore. Flowers small, about 5 mm. long, in branched, more or less dichotomous clusters which are erect, 10 to 20 mm. long, and inserted in the axils of leaves, which usually hide them, the leaves often covering part of the branch with their broadened base. Flower peduncles 5 to 6 mm. long, with small, subulate bracts. Buds elliptic-ovoidal, with 5 distinct ribs ending at the apex in obtuse tips and narrowing towards the base. Sepals 5, free almost to the base, oblong, villose externally, more or less keeled, with 3 well-marked veins. Petals 5, green, about as long as the sepals, oblong, obtuse, recurved and hood-shaped towards their apex, distinctly striate. Tube of the stamens membranous, pentagonal, divided into 10 segments; the 5 edges are fertile, the intermediate segments sterile. Fertile lobes covered in the bud by the petals, bearing outside the apex 6 thecæ. Sterile lobes somewhat recurved towards the apex and with a small horn on each side of their median portion, near the anthers. Ovary oblong, with 5 feebly marked lobes, 5-celled. Style simple, straight or feebly recurved towards the apex. Fruit red" (De Wildeman and Durand, 1897).

Additional characters of importance are found in the fruit, which in this species is about 1 cm. long and distinctly broader than high; its 5 lobes are rounded on the back and distinctly apiculate at the apex; each of the 5 cells contains two seeds.

Cameroon: Bipindi; Undua (Zenker); Lolodorf (Staudt); between Kribi and Ngumba (Dinklage).

Belgian Congo: Upper Congo: Bobi near Gali, type locality (Thonner); Kapinga; Ibaka; Yakusu (Émile Laurent); Barumbu (November 1, 1913; J. Bequaert; Coll. No. 1058); Dundusana (Mortehan); Mobwasa (H. Lemaire). Eastern Congo Forest: Yambuya (November 26, 1913; J. Bequaert); Avakubi (January 1, 1914; J. Bequaert; Coll. No. 1919); Niapu (Lang and Chapin); Ihulu between Mawambi and Irumu (Mildbraed); near Walikale (January 1915; J. Bequaert); Mission St. Gabriel near Stanleyville (H. Kohl); Lesse (June 15, 1914; J. Bequaert; Coll. No. 4773).

All the specimens I have seen in the Belgian Congo agreed with the descriptions of *S. Thonneri*. It must, however, be noted that the shape and size of the leaves are extremely variable; it is not rare to see them a length of 30 to 40 cm. and a width of 12 to 15 cm.; they may be gradually tapering at the apex, abruptly constricted into an acumen, or even subobtuse.

ECOLOGY OF *Scaphopetalum Thonneri*

This species is in many places a common bush of the undergrowth in the primitive, rather dry, and often very shady Rain Forest. Its stems are irregularly branched and never grow very high, usually reaching 1 to 2 m., more rarely as much as 4 m. The young branches are densely covered with stiff, erect, brownish-red hairs, a peculiarity which is often found among myrmecophytes, though far from being the rule. While I have observed this plant in many places and at various seasons, I have but seldom seen it with flowers. These are inconspicuous, yellowish green, with the petals carmine red on the inner side.

The peculiar pouch at the base of the leaf-blade is shown on Plate XXVII, Figure 1, from a photograph taken by Mr. Lang. Such an ascidium is present on all the leaves of the plant, though its size is variable. As a rule, it consists of a very elongate, club-shaped evagination of the blade on the upper side, laterally near the midrib, and opens on the under side by a narrow slit its entire length. This pouch may be 25 to 50 mm. long and is very narrow in the distal half or two-thirds; nearer the base of the leaf it swells rather suddenly and reaches a width of 6 to 8 mm. The slit on the lower surface of the pouch is placed between the midrib and the first lateral vein, which, on that side of the leaf, is deflected from its normal, oblique course and runs close to and parallel with the midrib the whole length of the slit. Furthermore, at the distal end of the opening the deflected lateral vein is connected with the midrib by means of a short cross-vein. As a result of this peculiar structure, the base of the leaf becomes asymmetric, the pouch-bearing side being usually much narrower and tapering more gradually towards the petiole, while the opposite side expands into a broad, semi-cordate lobe which covers the branch. The leaves are apparently arranged alternately in two rows and are more or less horizontal, nearly in one plane. When a branch is seen from above with the extremity farthest from the observer, all the leaves to the right have the pouch on their right half, while those to the left have the pouch on the left half. This arrangement of the leaves and ascidia, more or less distichous in appearance, is well illustrated on the plate.

In most cases the pouches of this plant are empty, but on two occasions, at Barumbu and Yambuya, in November 1913, I found unidentified ants in them. These insects had established regular formicaries therein, with a queen, larvæ, and pupæ, and had even brought coccids into the cavities; furthermore, they had closed the slit almost completely with a tent of brownish vegetable fibres. At Niapu, in January 1914, Mr. H. Lang collected two species of *Engramma*, *E. kohli* Forel and *E. lujæ* Forel, from the ascidia of this *Scaphopetalum*. So far as recorded, the ants which inhabit these pouches are small and timid; they do not emerge from their retreats when the plant is disturbed and contribute little or nothing to the protection of their host. The leaves of *Scaphopetalum Thonneri* are frequently injured by phytophagous insects, even when their pouches are occupied by ants.

While drawing up the original description, De Wildeman and Durand found a few ants in the pouches of the specimens collected by Thonner and thus recognized the myrmecophily of this species. Émile Laurent's short field-notes are to be found in the account of the plants he collected (De Wildeman, 1907).

Flacourtiaceæ

Only one genus of this family, *Barteria*, is definitely known to contain true myrmecophytes. Certain species of other genera have been found in association with ants, but there is reason to believe that they had been settled only by accident. The best-known of these is the African *Buchnerodendron speciosum* Guerke,[1] a common bush or small tree of the primary Rain Forest, also found in forest galleries along streams in the Savannah. On a specimen observed at Romée, near Stanleyville, H. Kohl (1909, pp. 109-110) found that "the branches, 1 m. in length, were all hollow to within 5 cm. of their tips and inhabited by small black ants, *Crematogaster excisa* Mayr.[2] Two or three apertures led into the cavity. I did not find coccids on the inner walls of these branches, several of which I cut open, though such were seen in the axils of the leaves where they were actively attended by the ants." Kohl, however, believes that this plant was only accidentally occupied by ants, an opinion with which I am in complete agreement. I have repeatedly found this *Buchnerodendron* growing under a variety of conditions and, though my attention was especially directed to its possible relations with ants, I never saw any of these insects inside its branches.

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[1] Described in Engler's Bot. Jahrb., XVIII, 1894, p. 161, Pl. IV.

[2] Forel (1909b, p. 69 and 1916, p. 408) identified this ant found by Kohl inside *Buchnerodendron speciosum* as *Crematogaster impressa* Mayr.

In the original description of *Caloncoba Laurentii* (De Wildeman and Durand)[1] the branches of this tree are said to be fistulose and the following notes are given: "*C. Laurentii* is myrmecophilous; the stem is hollow for a long distance and pierced with exit holes at various levels, either at the cicatrice of a leaf base or at any other point along the internode. There were several ants inside the specimens we saw." Gilg, who, it seems, examined some of the type material, did not find the stems hollow nor pierced with orifices, and concluded that one of the branches had been accidentally settled by ants, probably in a former burrow of some wood-boring larva.

BARTERIA J. D. Hooker

Barteria J. D. HOOKER, 1860, Journ. Linn. Soc. London, Botany, V, p. 14. MASTERS, 1871, in Oliver, 'Flora of Tropical Africa,' V, p. 510.

Tree or shrubs, rarely over 20 m. high, usually much lower, with thick, horizontal branches. Leaves large, leathery, alternate, oblong or oval, subacuminate, almost entire, with short, thickened petioles. No stipules, the decurring base of the leaf forming a raised line on both sides of the stem. Flowers dichlamydeous, hermaphrodite, subsessile, arranged in dense axillary or supra-axillary tufts or rows, rarely solitary; surrounded by overlapping bracts which completely enclose the flower-bud. Calyx-tube short, deeply divided into 5 oblong-lanceolate, overlapping, white sepals, which are silky at the outer side. Petals 5, inserted on the inner edge of the calyx-tube, similar to the sepals, white. Corona duplicate, emerging from the throat of the calyx-tube; outer row membranous, jagged at the edge, about half the length of the petals; inner row much smaller, consisting of a ring of thick, fleshy tubercles. Stamens numerous, monadelphous at the base, emerging from the base of the calyx-tube; filaments in two rows; anthers linear-oblong, introrse. Ovary sessile, globose, surmounted by a single, thick style, which terminates in a large, mushroom-shaped stigma. Ovules numerous, inserted on 3 or 4 parietal placentas. Fruit a coriaceous, ovoid, indehiscent berry; seeds ovoid, compressed, with a crustaceous, coarsely pitted testa.

The genotype, *B. nigritana* J. D. Hooker, was discovered by Barter at the mouth of the Niger, during the Baikie Niger Expedition (1859). The genus is strictly Ethiopian with a small number of species peculiar to the Rain Forest and extending but little beyond it into the forest galleries of the neighboring grass-lands. The area of its distribution, indicated by the interrupted line on Map 19, falls entirely within the limits of the "Western Forest Province" as defined by Engler. That *Barteria* is thus far unknown from the forests of Upper Guinea, west of

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[1] 'Contributions Flore du Congo,' I, 1899, p. 8 (Coquilhatville). According to Gilg (Engler's Bot. Jahrb., XL, 1908, p. 463), this is merely a synonym of *Caloncoba Welwitschii* (Oliver), a common bush or low tree in the forests of Cameroon, Gaboon, Belgian Congo, and Angola. The synonymy of *C. Laurentii* and *C. Welwitschii* is accepted by Th. and H. Durand in their 'Sylloge Floræ Congolanæ,' 1909, p. 37. I have very often observed *C. Welwitschii* and never seen it associated with ants.

Nigeria, is remarkable, and can hardly be ascribed to insufficient investigation. Nor has its guest ant, *Pachysima*, been recorded there, which is interesting in view of the fact that Map 19 shows the known distribution of the two species of that ant genus to be included within the area occupied by *Barteria*. This genus of pseudomyrmine ants is, indeed, almost restricted to the hollow stems and swellings of various *Barteriæ*, its only other known habitat being the caulinary swellings of *Epitaberna myrmæcia* in Cameroon (Stitz, 1910, p. 131; see p. 442). It would not be amiss to ascertain whether the *Barteriæ* of Uganda are also inhabited by these ants.

The species of *Barteria* are, together with those of *Scaphopetalum*, the commonest and most widely distributed of African myrmecophytes. They are erect bushes or small trees with a very characteristic habitus. Either all the branches are uniformly hollow throughout or some of them have hollow swellings at their base. The flowers are large and showy, with white calyx and corolla, numerous stamens and a single, entire style ending in a mushroom-shaped stigma; they are enclosed in overlapping bracts and placed in oblique rows, in loose tufts, or singly, in the axils of the leaf or along the decurrent leaf-bases.

There are undoubtedly a number of different species in the genus; but how many is hard to say at present, since the published diagnoses are so incomplete as hardly to permit the correct identification of specimens. Gilg (1908) recognizes four species in his recent revision of African Flacourtiaceæ, but he has evidently overlooked the description of *B. acuminata* E. G. Baker, which is possibly identical with *B. Stuhlmannii* Gilg.

Barteria acuminata Baker

Barteria acuminata E. G. Baker, 1905, Journ. Linn. Soc. London, Botany, XXXVII, p. 155.

"Low tree or bush. Branches striate, with fine rufous pubescence, or later on glabrate. Leaves oblong or oblong-elliptic, coriaceous, almost glabrous, acuminate at the apex, attenuate at the base into the petiole. Petiole very short, thick, not stipulate, decurrent. Leaf-blade with about 16 to 19 lateral veins visible on both sides and uniting arcuately before the margin; also with a reticulate venation rather prominent on the upper face. Flowers: 1 or 2 in the axils, sessile, bracteate at the base; the bracts numerous, closely imbricate, cupuliform, brown, shiny, ciliate along the margin. Sepals 5, ovate-oblong, acuminate, longer than the petals, coalescent at the base. Petals white, oblong, mucronate at the apex. Stamens numerous. Stigma very large, conical-globose, yellow. Fruit globose.

"Species related to *B. nigritana* Hook. fil., but differing in the leaves being gradually acuminate at the apex.

"Leaves 22 to 24 cm. long, 6 to 7 cm. broad. Petiole about 6 to 8 mm. long, canaliculate above. Sepals 2.8 to 3 cm. long, 10 to 11 mm. broad. Anthers about 3 mm. long" (E. G. Baker, 1905).

Uganda: Musozi on the shore of Lake Victoria, type locality (Bagshawe). This is very close to Bukoba, the type locality of *B. Stuhlmannii* which perhaps is merely a synonym of *B. acuminata*.

Barteria Dewevrei De Wildeman and Durand

Barteria Dewevrei É. De Wildeman and Th. Durand, 1899, 'Contributions Flore du Congo,' I, p. 8; 1901, 'Reliquiæ Dewevreanæ,' p. 97. É. De Wildeman, 1906, 'Mission Émile Laurent,' fasc. 3, pp. 247–249, Pl. xxxii; 1908, 'Études Flore Bas- et Moyen-Congo,' II, p. 316. Gilg, 1908, Engler's Bot. Jahrb., XL, p. 480. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 108. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 223.

"Tree 5 to 6 m. high, branched, glabrous. Leaves oblong-elliptic, green above, paler underneath, brown when dried, acuminate, attenuate at the base into the petiole, which is very short, thick, blackish, not stipulate, decurrent; the blade 27 to 34 cm. long and about 11 cm. broad; with about 14 nerves below and above on each side, uniting before the margin; the under side with a feebly prominent, reticulate nervation. Flowers 2 to 4 together, axillary, sessile, bracteate at the base, the bracts numerous and closely imbricate, cupuliform, brown, smooth. Sepals 5, white on the inner side, rufous-velutinous on the outer side, oblong, united at the base, acuminate, about 3.5 cm. long and 1.5 cm. broad. Petals little longer than the calyx, white, oblong-obtuse, about 3.5 cm. long and 1.4 cm. broad. Stamens inferior, numerous, in several rows, coalescent at the base, with white filaments and yellow anthers, about 3 mm. long. Ovary globose, green, glabrous, with a heavy style and a very large, conico-globose, 5-lobed, yellow stigma (according to Dewèvre). Fruit globose, 2.5 cm. broad, with three parietal placentas" (De Wildeman and Durand, 1899).

Judging from the descriptions, this species is a near relative of *B. nigritana*. De Wildeman and Durand compare it with that species, and in a later publication De Wildeman (1908, p. 248) writes that *B. Dewevrei* is "perhaps only a variety" of *B. nigritana*. Gilg (1908, *loc. cit.*), however, says: "this species is very closely allied to *B. fistulosa* Mast., yet, I presume, distinct from it. The broad, thick, leathery leaves are different, as also the larger flowers, and above all is the fact that the flowers are inserted as a rule 3 or 4, rarely 5, together in the axils of the leaves."

Only known thus far from the Belgian Congo: Lower Congo: Sabuka (Ém. and M. Laurent); Leopoldville (March 26 and May 19, 1915; J. Bequaert; Coll. Nos. 7173 and 7663). Kasai: Dima; cliffs of Batempa; along the Sankuru; Kondué; Bena Dibele; Olombo (Ém. and M. Laurent); Bena Makima; Bombaie (Lescrauwaet). Middle and Upper Congo: Bolombo; Inongo (Ém. and M. Laurent); Bangala, type locality (Dewèvre; Hens). Eastern Congo Forest: Yalutcha; Yanonge (H. Kohl).

Barteria fistulosa Masters

Barteria fistulosa Masters, 1871, in Oliver, 'Flora of Tropical Africa,' V, p. 511. K. Schumann, 1890, Verh. Bot. Ver. Brandenburg, XXXI, 2, p. 121, footnote. A. Engler, 1892, Engler's Bot. Jahrb., XIV, p. 392. Warburg, 1894, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 6a, p. 27, fig. 2*B*. É. De Wildeman and Th. Durand, 1901, 'Reliquiæ Dewevreanæ,' p. 98 (type and variety *macrophylla*). H. Winkler, 1906, Engler's Bot. Jahrb., XXXVIII, pp. 259-260. É. De Wildeman, 1906, 'Mission Émile Laurent,' fasc. 3, pp. 250-258, Pls. xci and xcii; 1907, 'Études Flore Bas- et Moyen-Congo,' II, 1, p. 57; 1908, ibid., II, 3, p. 316. H. Winkler, 1908, Aus der Natur, III, p. 661. Gilg, 1908, Engler's Bot. Jahrb., XL, p. 480. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 97–108. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 223. Engler, 1910, 'Die Pflanzenwelt Afrikas,' I, 2, p. 642, fig. 553*B*. J. Gillet and E. Pâque, 1910, 'Plantes Principales Kisantu,' p. 81. Gilg, 1913, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' II, p. 568. É. De Wildeman, 1920, 'Mission de Briey au Mayumbe,' pp. 104, 203, and 255.

"A small tree with angular, smooth or lenticellate, fistular branches. Leaves leathery, 10 to 12 in. long, 3 to 4 in. wide, oblong, obtuse, glabrous, 1-nerved, somewhat narrower at the base which is decurrent along the branch. Stipules 0. Flowers sessile, in linear clusters emerging from the stem between it and the decurrent edges of the leaf, each encircled at the base by numerous overlapping leathery shiny chestnut-colored oblong obtuse or boat-shaped bracts, increasing in size from below upwards. Flowers smaller than those of *B. nigritana*. Sepals and petals downy on the outside, lanceolaté, wavy at the margins. Corona and inner organs of the flower as in the last-named species, but smaller. Anthers apiculate.

"The so-called decurrent leaves would probably be more correctly described as congenitally adnate to the branch for some distance. The manner in which the flowers emerge from between the sides of the base of the leaf and the stem is very curious" (Masters, 1871).

De Wildeman and Durand's variety *macrophylla* (1901) was based on specimens with larger leaves (25 to 35 cm. long; 14 to 15 cm. broad); but, as De Wildeman observed later, this variety cannot stand, because the shape and size of the leaves in this species are extremely variable: "the normal obovate-elliptic shape, rather broadly cuneate at the base, may change in terminal leaves into elongate obovate-lanceolate, very long-cuneate at the base and reaching a length of 27 cm. by a width of 7 cm. In other forms. . . broadly obovate, shortly attenuate leaves reach a length of 38 cm. and a width of 16 cm." ('Mission Émile Laurent,' p. 249.)

According to H. Winkler (*op. cit.*, p. 260, footnote) there are two forms of *B. fistulosa* in Cameroon: "In one of them the lateral hollow branches inhabited by the ants are longer, the leaves are larger and inserted on the branch by a broader base. In this form the fruits are mostly divided into four, while in the other form they often consist of 5, or even 6, carpels. There was also a clear and characteristic difference in the shape of the seeds; while in the first variety they are 6 to 7 mm. long, 3.5 to 4 mm. wide and 2 mm. thick, the seeds of the other which were the same length measured only 3 mm. in width or even less, being thus much more slender."

Fernando Po, type locality (Mann).

Cameroon: Victoria (Wederbauer; Winkler); Barombi (Preuss; Staudt); Bipindi (Zenker).

Belgian Congo: Lower Congo: Tumba (Ém. and M. Laurent); Kisantu (Gillet); Thysville (June 4, 1915; J. Bequaert). Kwango: Madibi (Lescrauwaet). Kasai: Dima; Manghe; Lomkala; Olombo (Ém. and M. Laurent); Bachi-Shombe (Lescrauwaet). Middle and Upper Congo: Ibali; Inongo; Eala; Botuma; Bolombo (Ém. and M. Laurent); Coquilhatville (Dewèvre); Lake Leopold II (Body); Betutu (Bruneel); Barumbu (October 28 and November 17, 1913; J. Bequaert; Coll. Nos. 1003 and 1209). Eastern Congo forest: Stanleyville (Dewèvre; February 1915, J. Bequaert and H. Lang); Romée; Yangandi; Yalutcha; Yanonge (H. Kohl); Avakubi (January 17, 1914; J. Bequaert); Penge and at many places in the forest between Penge and Irumu (February 1914; J. Bequaert; Coll. No. 2339); Moera near Beni; between Mawambi and Avakubi (Mildbraed); in the forest between Walikale and Lubutu (January 1915; J. Bequaert). Mr. H. Lang also photographed at Medje what is evidently this species. Mayombe: Ganda Sundi (de Briey).

Winkler (1906, pp. 259-260) has published some interesting morphological and ethological notes on *Barteria fistulosa* studied by him at the Botanical Garden of Victoria, Cameroon.

One of the flowering periods,—if there be more than one—starts in March. The large white flowers are crowded together side by side on the broad base of the leaves. They seem to open with dawn and the anthesis apparently lasts a few hours only. I have not found nectar in them and never observed pollinating insects; bugs and little beetles which are often found in the flowers, have I presume, hardly to be considered as such; nor, as it seems to me, the ants which inhabit the tree. The fruits ripen about 3 months after the flowering. They have the shape of a walnut, and are 3.5 to 4 cm. long with a diameter of 27 to 30 mm. They are flattened on two sides at the base by pressure against one another. They have four distinct protuberances at the apex, the stump of the style being placed between the four grooves. The fruits which I picked were covered at their base by the brown, closely appressed calyx;[1] however, the latter apparently remains on the tree when the ripe fruit drops. The consistency of the fruits can best be compared with that of a celluloid ball. The numerous, parietal placentas are arranged on four longitudinal bands. Each seed is enveloped by an arillus-like pulp, which has an agreeable, sweet-sour flavor; the pulp of the various seeds fills the fruit with a slimy mass. The seed is flattened, of rounded-rhomboid shape, with a small umbilicus and a network of dimples on the surface. To be sure the seeds are scattered by animals, which trace the pulp. The genets which I kept in captivity preferred these to almost all fruits. I have found, on fruits still adhering to the tree, holes the size of a hazelnut or an entire half of the pericarp lacking; the seeds together with the arillus had disappeared. Traces of bites could be distinctly recognized on a number of fruit envelopes which I found at some distance from one of the trees; they certainly were not from a bird's bill, but from teeth, probably of fruit-eating bats.[2] When compressed, and consequently also when bitten, the fruits split open at the top in the form of a cross between the grooves; but they open by themselves only when rather intensively drying.

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[1] The author evidently means the involucrum of bracts, not the true calyx.

[2] In the African Rain Forest fruit bats undoubtedly are important agents in scattering the seeds of many fruit-bearing trees. See the remarks on this subject by H. Winkler (1906, p. 236) and H. Lang and J. P. Chapin (1917, Bull. Amer. Mus. Nat. Hist., XXXVII, p. 484).

Barteria nigritana J. D. Hooker

Barteria nigritana J. D. Hooker, 1860, Journ. Linn. Soc. London, Botany, V, p. 15, Pl. II, figs. 1–5.

Barteria nigritiana Masters, 1871, in Oliver, 'Flora of Tropical Africa,' II, p. 510. H. Winkler, 1906, Engler's Bot. Jahrb., XXXVIII, p. 260, footnote. Gilg, 1908, Engler's Bot. Jahrb., XL, 1908, p. 479; 1913, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' II, p. 568.

Barteria Braunii Engler, 1892, Engler's Bot. Jahrb., XIV, p. 392. Warburg, 1894, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 6a, p. 27, fig. 2*A*. Engler, 1910, 'Die Pflanzenwelt Afrikas,' I, 2, p. 642, fig. 553*A*.

"A small tree or shrub with stout branches, covered with rusty down, and marked on either side with a raised line continuous with the base of the leaves. Leaves coriaceous glabrous, 6 to 10 in. long, 2 to 3 in. wide, oblong, subacute, crenulate or entire; unicostate, rounded at the base or tapering into a short, thick leaf-stalk. Stipules deciduous. Flowers large, 1 to 1½ in. in diameter, sessile or subsessile in axillary tufts, each tuft consisting of 2 to 4 flowers, each of which is invested in a series of overlapping coriaceous chestnut-colored acute or cuspidate bracts. Flower-tube very short, glabrous. Sepals 5, somewhat coriaceous, oblong-lanceolate or obtuse, downy and golden brown on the outer side, smooth and whitish within. Petals oblong, wider than the sepals and about equal to them in length, white. Stamens hypogynous or slightly perigynous; filaments slender. Ovary smooth; style simple, as long as the filaments and terminated by a large conical or cushion-shaped stigma. Fruit ovoid, about the size of a pigeon's egg, coriaceous, reddish, 1-celled, with numerous compressed pitted seeds attached to parietal placentas" (Masters, 1871).[1]

Southern Nigeria: Nun River, type locality (Barter); Bonny River (Mann); Old Calabar (Thomson).

Cameroon: Batanga (Dinklage); Kribi (Zenker).

Spanish Guinea: on the coast of Bata near Campo (Busse).

French Congo: on the Gaboon River near Libreville (Mildbraed).

As pointed out by Gilg this species seems to be restricted to the coastal forest belt ("eine echte Seestrandspflanze") which grows inland of the mangrove formation along the Gulf of Guinea. Similar patches of dense forest are to be found immediately landward to the mangroves in the estuary of the Congo, but I have never seen any *Barteria* there.

Barteria nigritana variety **uniflora** De Wildeman and Durand

Barteria nigritana variety *uniflora* É. De Wildeman and Th. Durand, 1900, 'Contributions Flore du Congo,' II, p. 24; 1900, Bull. Herbier Boissier, (2) I, p. 22. É. De Wildeman, 1904, 'Études Flore Bas- et Moyen-Congo,' I, p. 169. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 109. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 224.

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[1] J. D. Hooker's original diagnosis is as follows: "Frutex robustus, habitu *Smeathmanniæ*, foliis 6–10'' long., 2–3'' lat., nervis primariis numerosis. Stipulæ deciduæ, non visæ. Flores sessiles, circiter 1–1½'' diametro, iis *Smeathmanniæ* subsimiles. Bracteæ numerosæ arcte imbricatæ, alabastrum maturum velantes, late ovatæ cuspidato-acuminatæ. Petala calyce paulo longiora. Stamina perplurima. Ovarium glaberrimum. Fructus magnit. ovi columbæ."

"A high tree, with thick branches, which are striate, ferruginous-pubescent, marked on either side with a raised line connecting the leaf-bases. Leaves alternate, shortly petiolate; the petiole 5 to 6 mm. long and 3 mm. broad; oblong, subacuminate, 11 to 17 cm. long and 3.7 to 5.5 cm. wide, entire, shiny above and below, dark above, paler below, the upper side subglabrous or with a few scattered hairs; the under side with short, sparse, brown pilosity, especially on the veins; lateral nerves a little prominent above and below, arcuately anastomosing towards the margin and prominent in the more or less recurved margin. Flowers sessile, solitary in the axils of the leaves; at the base with closely imbricate bracts, which are scarious, brown, pilose externally, embracing. Calyx with ovate-lanceolate lobes, ferruginous pilose on the outer side, glabrescent on the inner side, acuminate, 3 cm. long and 12 mm. wide. Petals equal to the sepals but completely glabrous. Corona erect, membranaceous, fimbriate-lacerate at the apex. Stamens numerous, with connate filaments. Ovary globose, with parietal placentas, and numerous ovules; style solid; stigma very large, 6 to 7 mm. broad, conico-globose" (De Wildeman and Durand).

Belgian Congo: Lower Congo: Forest of Talavanje, type locality (Cabra); Kisantu (J. Gillet).

It seems doubtful whether this form is really a variety of *B. nigritana* in view of its occurrence inland far from the coastal belt. It may possibly be specifically distinct or constitute a form of *B. Dewevrei*, a species commonly found in the Lower Congo. From the description, it appears very similar to *B. Stuhlmannii*.

Barteria Stuhlmannii Engler and Gilg

Barteria Stuhlmannii Engler and Gilg, 1908, Engler's Bot. Jahrb., XL, p. 479.

Barteria nigritiana Warburg, 1895, in Engler, 'Pflanzenwelt Ost-Afrikas,' C, p. 278 (not *nigritana* Hooker).

"Shrub or tree with fistulose branches, which are densely and very shortly fulvo-pilose when young. Leaves ovate or ovate-oblong, very seldom oblong; acute or often shortly and broadly acute-acuminate at the apex, rounded toward the base, though narrowed at the very base into a 6 to 8 mm. long petiole, on both sides of which there is a 3 to 4 mm. wide wing; leaves obsoletely sinuate-denticulate, or more often subentire, with cartilaginous margin, glabrous above (except on the median nerve), very sparsely and shortly pilose below, leathery, with 13 to 15 pairs of lateral nerves which run almost straight to near the margin where they unite by curves; with numerous transverse nerves running parallel to each other and strongly prominent on both sides; other reticulate veins almost absent. Flowers solitary or occasionally by twos in the axils of the leaves. Bracts enclosing the flower in an involucrum, coriaceous, with scattered fulvous pilosity on the back. Outer sepals entirely covered on their outer side with dense fulvous pile, which on the back of the inner sepals forms only a median vertical line; otherwise glabrous, oblong, with very acute apex. Petals a little shorter than the sepals, but similar in shape, very tender; glabrous. Outer corona membranous, glabrous, about half the length of the petals, unevenly incised and fimbriate; inner corona much shorter, thickened, forming a raised ring which is distinctly but feebly emarginate and furrowed. Stamens numerous, coalescent at the base into a tube. Ovary short, turbinate, glabrous, with 4 parietal placentas. Style elongate, reaching the anthers, thick, gradually thinner upwards, ending in a very thick, head-shaped stigma. Fruit subglobose; the pericarp parchment-like or chartaceous, fragile; seeds numerous, inserted on 4 parietal placentas, oblong, yellowish, with pitted testa.

"The winged petiole is 6 to 8 mm. long and, with both wings spread, 7 to 9 mm. wide. The swollen, hollow stalk is 6 to 10 mm. thick. The blade of the leaf is 16 to 19 cm. long, 7 to 9 cm. broad. The bracts which enclose the base of the flowers are 7 to 9 mm. long and equally wide. The outer sepals are about 2.5 cm. long, 1 cm. wide; the inner ones decrease gradually. The petals are about 2.2 cm. long, 8 to 9 mm. broad. The style is about 1.5 cm. long, the stigma 4 mm. long and 3 mm. thick at the base. The fruit has a diameter of about 2.5 cm. The seeds are 5 mm. long, 3 mm. wide and 1.5 mm. thick" (Engler and Gilg, 1908).

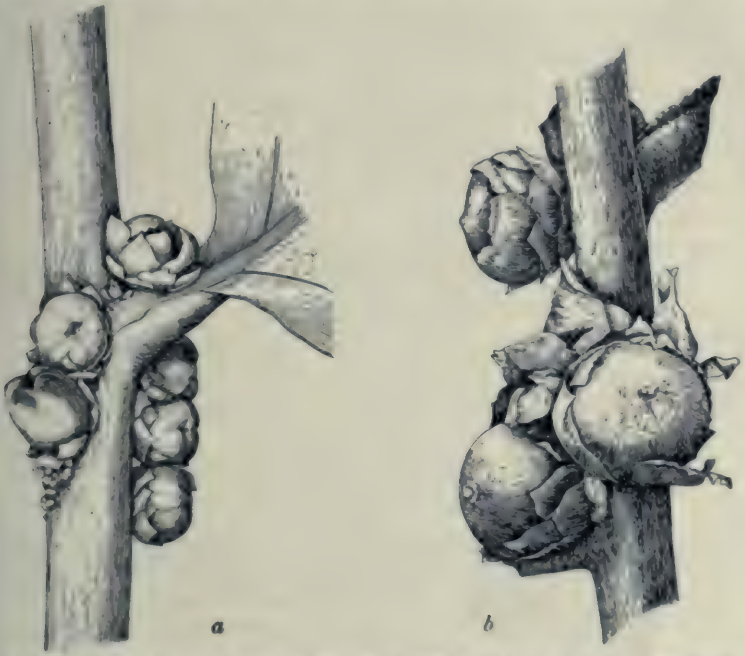

Fig 85. a, *Barteria fistulosa* Masters: portion of branch with fruits along decurrent leaf base; *b*, *Barteria Dewevrei* De Wildeman and Durand: portion of branch with fruits clustered in axils of leaves (after De Wildeman, slightly modified).

German East Africa: Bukoba, type locality (Stuhlmann).

This plant will, I believe, prove to be identical with *B. acuminata* E. G. Baker (see above, p. 425), described from Musozi on Lake Victoria, which is practically the same locality as Bukoba.

During my travels in the Belgian Congo, I came across two species of *Barteria*, *B. Dewevrei* and *B. fistulosa*. The latter is by far the more common and can be best recognized by the very peculiar way in which it grows, by the basal swellings on some of its horizontal branches, and especially by its inflorescence. In this species a number of flowers or fruits are placed close together in a row on either side of the petiole from the axil along the decurrent base of the leaf (Fig. 85*a*). In *Barteria Dewevrei*, however, the flowers or fruits occur either singly in the axils of the leaves or two to four together in loose axillary clusters (Fig. 85*b*). The anatomical structure of the two species also shows certain differences, which have been pointed out by Prof. Bailey (Part V, p. 599).

ECOLOGY OF *Barteria fistulosa*

Perhaps the most striking of Congo myrmecophytes, this plant occurs throughout the entire Rain Forest belt, where it favors the higher, more open spots, being rarely met with in damp soil. In the Savannah of the Lower Congo and Kasai District it follows the forested banks of water courses. The natives of the forest are familiar with the plant and aware of its being inhabited by very aggressive ants. When clearing the underbrush to establish a road or plantations, they usually avoid the unpleasant task of cutting this small tree. Thus it happens that *Barteria* is frequently found standing by itself in the center or near the sides of forest paths (Pl. XXIX). For the same reason, it is often met with in secondary forest growth. Among the Wangata, at Barumbu and elsewhere, its vernacular name is "Bakokombo," and other Bantu tribes use similar sounding designations (Monkukono, Makonkomo, Okakumbu, etc.)[1]

This species is a typical element of the undergrowth of the forest. Under favorable conditions it may become a small tree, reaching a height of from 6 to 10 meters, or in exceptional cases 20 meters or more, but it is frequently much lower, 3 to 4 meters being a common average; its trunk is, as a rule, 10 cm. in diameter, though there are occasional records of over 40 cm. The trunk is simple or very little ramified, and bears long lateral branches, usually also unramified and spreading almost horizontally in all directions. The broad, alternate leaves are placed to the right and left of the branch, more or less horizontally or slightly curved upward. Due to this arrangement, the plant has a very peculiar appearance, well illustrated in the photographs taken by Mr. H. Lang (Pl. XXVIII, Fig. 1 and Pl. XXIX). Another unusual feature is the fact that most of the branches are deciduous. On reaching a certain length they stop growing, lose their foliage, and gradually dry up; finally, these dead members are dropped by a histological process similar to that causing the leaves to fall. One always finds, therefore, a number of dead branches scattered over the ground at the base of this *Barteria*. Whether there is a law of periodicity or other rule governing this peculiarity cannot be decided at present, but so much is sure: the few flowering branches remain on the stem until after the fruits are ripe.

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[1] According to J. Gillet, the natives at Kisantu, in the Lower Congo, call *Barteria fistulosa* either "Sakala" or "Nsakala," and de Briey gives "Zinzi" as its vernacular name in the region of Ganda Sundi.

The lateral branches of *Barteria fistulosa* are of two kinds. The sterile branches—and, as noted, these are in the great majority—present at a short distance from their base an abrupt and conspicuous swelling which continues almost uniformly to near the apex with only slight constrictions at the nodes (Plate XXVIII, Fig. 2; Text Fig. 86). Except in very young plants, these swellings are nearly always hollow and inhabited by ants. The flowering branches appear only at certain seasons, and on older trees; they are normal, not swollen, yet frequently hollowed out and also occupied by ants.

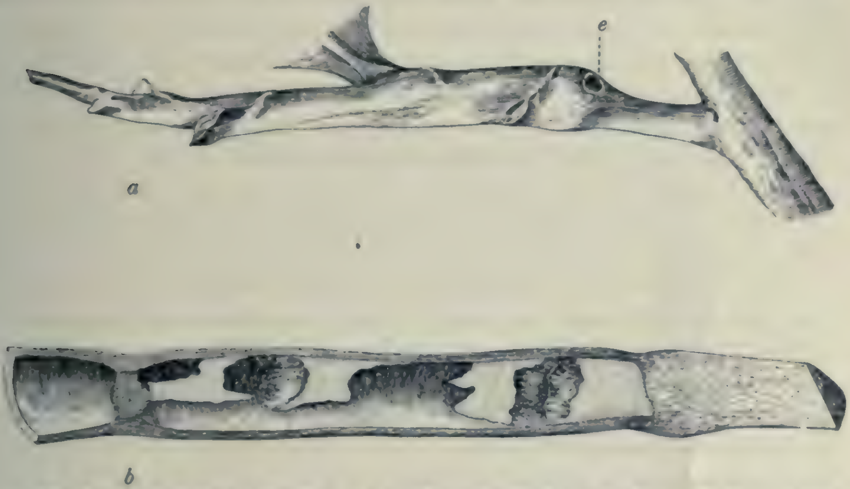

Fig. 86. *Barteria fistulosa* Masters: a, lateral branch suddenly swollen beyond its base, where it shows the circular opening (*e*) gnawed by the ants and leading into the domatium; about one-half natural size (after De Wildeman); *b*, part of longitudinal section of very young swollen lateral branch, showing gradual drying up of pith before ants gain access to the cavity; drawn from life at Barumbu, October 1913; natural size.

From an examination of very young specimens and others not inhabited by ants, I found that the trunk and normal, flowering branches are filled with pith and remain so unless excavated by the ants. The swollen branches (Fig. 86), on the contrary, become hollow naturally.

When young, their various internodes are at first only slightly swollen and entirely filled with soft, greenish, parenchyma; soon, however, the enlargement becomes more pronounced; the pith turns pale brownish, gradually dries and what remains finally forms brownish membranes on the inner walls or irregular partitions in a spacious cavity (Fig. 86*b*). The ant-chamber is thus ready for occupancy before the insects touch the branch. On uninhabited plants the sterile branches show no orifice, nor any depression or scar on their outer surface that might mark the spot where the entrance to the cavity will later be pierced by the ants. Moreover, the walls of the limb are soft and easily pressed down with the fingers, so that they must offer but little resistance to the powerful mandibles of the *Pachysimæ*.

The larger specimens of *Barteria fistulosa* that one commonly meets in the forest are, as a rule, settled by a populous colony of the large, black *Pachysima æthiops* (Emery),[1] the true body-guard of the tree. As soon as any portion of their host plant is disturbed, they rush out in numbers and hastily explore the trunk, branches, and leaves. Some of the workers usually also run over the ground about the base of the tree and attack any nearby intruder, be it animal or man. All observers agree that the sting of the *Pachysima* is exceedingly painful and is felt for several hours. Its effects can best be compared with those produced by female velvet ants (Mutillidæ; see Kohl's remarks reproduced in Prof. Wheeler's Report, p. 115). Consequently these ants are greatly dreaded by the natives and there remains little doubt that they afford a most effective protection to their host plant.

Trees inhabited by *Pachysima* are generally healthy and free from the attacks of most phytophagous insects. On specimens untenanted by ants, however, the leaves are often badly eaten by caterpillars, as I observed in two instances at Barumbu in October, 1913. On both of these trees there were also several nests of the weaver-ants, *Œcophylla longinoda* (Latreille), and numerous workers of a small *Crematogaster* running over the branches and leaves. At Penge, in February, 1914, another uninhabited *B. fistulosa* showed the live wood of its trunk badly bored by adult bostrychid beetles. On the other hand, the *Pachysimæ* are not always successful in keeping smaller parasites from their host. At Barumbu a tree occupied by a populous colony of *P. æthiops* showed numerous cecidomyid galls on its leaves. They were small fleshy swellings of the parenchyma, about equally protruding on both sides of the leaf, and irregularly scattered. Inside of them was a single chamber containing one gall-midge larva and surrounded by a wall of coarser tissue in the center of a solid, juicy, parenchymatous mass.[1]

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[1] Probably sometimes also by *Pachysima latifrons* (Emery).

An older, inhabited *Barteria fistulosa* may be regarded as the home of a single colony of *Pachysima* which has resulted either from the gradual growth of a small nest founded by one female, or from fusion of several nests started independently by a number of females. Both modes are possible, but the second is probably the more common. At Avakubi, in January, 1914, I had an opportunity to examine a very young *Barteria fistulosa* not over one meter high, with but six short, horizontal branches, all of which were swollen beyond the base in the usual way. Only a few of the distended internodes were settled by ants and each was a closed, separate cavity containing one deälated *Pachysima* queen; no workers, larvæ, or eggs were present. After the nuptial flight the *Pachysima* females had evidently entered the hollow internodes by gnawing through the wall. They had not again left the cavity, for the entrance was partly plugged up by callus growth. When disturbed, these gravid queen ants made no attempt to defend themselves, behaving in this respect very differently from workers. It is also interesting to note that some of the *Pachysima* females were dead and that in one such case another minute ant, of an unidentified species, had established its nest in the same internode with the remains of a dead *Pachysima* queen. A colony of *Pachysima æthiops* in a somewhat more advanced stage was found in a young *Barteria fistulosa*, at Barumbu in November, 1913. A queen ant, surrounded by an abundance of eggs and young larvæ, was found inside each of a series of swollen internodes, all still separated by the nodal partitions. Here, too, a growth of callus had partly closed the entrance which had been further plugged with dried particles of pith evidently brought there by the female. Since the older *Barteria* is finally occupied by one single colony, all the members of which live and work peacefully together and enter indifferently the various domatia, the initial formicaries in all probability fuse into one. The workers in such a formicary not only enlarge the exit holes, which are usually placed at the base of the swelling toward the upper face of the branch, but also clean the cavities of the remains of dried pith and pierce the partitions between the various internodes. Each lateral branch finally forms one continuous gallery.

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[1] Lamborn (1914, p. 493) notes that he once found larva and pupa of *Tinthia lambornella* Durant, an ægeriid moth, in an internode of a *Barteria* in Southern Nigeria; this cavity was separated from the adjoining internodes, both of which were inhabited by *Pachysima æthiops*.

The origin and growth of new colonies of *Pachysima* in *Barteria* deserves to be further investigated in the field. Perhaps such a study will show us typical examples of secondary pleometrosis, or founding of an insect society through fusion of a number of colonies each started independently by a fertile female. H. v. Ihering (1907) believes *Cecropia adenopus* is settled in this manner by *Azteca mülleri*. Furthermore, in his opinion, all but one of the fertile queens inhabiting the same tree are eventually killed by the workers, a conclusion drawn from the presence of a sole queen in each adult *Cecropia*. It will be important to look into conditions in this respect in the *Pachysima* formicaries of *Barteria*.

The *Pachysimæ* undoubtedly derive certain advantages from living inside *Barteria*. The hollow, nearly horizontal branches provide very convenient nesting chambers, where the brood is kept in safety under almost ideal conditions of aëration, temperature, and humidity. Whether the ants also procure part or all of their food from the host is still doubtful. Kohl has often seen the workers actively licking nectaries at the insertion of the leaves, and also gnawing the young bark and the epidermis on the upper and under sides of the blades; they are particularly fond of the very young flowers, which they frequently destroy almost completely. Certain other insects live in the domatia with the ants, the most common of these companions being coccids (*Pseudococcus citri* variety *congoënsis* Newstead) which, I am inclined to think, are not brought in by the ants, but migrate inside the swellings of their own accord. I have found this to be also the case with scale insects living in the myrmecodomatia of *Cuviera*. Even in very young *Barteriæ*, of which only a few internodes are occupied by queen ants and their brood, one discovers coccids in the cavities. Another interesting inquiline of *Barteria* is a minute phorid fly, *Hypocera tristis* H. Schmitz, noticed by Father Kohl near Stanleyville in swellings of *Barteria fistulosa* occupied by *Pachysima æthiops* (Wasmann, 1915*a*, p. 320, footnote).

Whether the coccids of *Barteria* are really attended by *Pachysima* for the sake of their excretions remains uncertain. Wheeler and Bailey (1920, pp. 261–262) have dissected the pellets contained in the infrabuccal pockets of workers and the trophothylaces of larvæ of *Pachysima æthiops* and *P. latifrons*. They were much the same in both species and consisted of pieces of coccids or whole, crumpled-up bodies of young scale insects, fungus spores, bits of mycelium, portions of plant-tissue evidently gnawed from the walls of the cavities, pollen-grains, etc. In a few of the pellets Prof. Bailey found small nematodes resembling the species of *Pelodera* described by Janet as living both as parasites in the pharyngeal glands of certain European ants and as free organisms in the detritus of the nest.

A thorough investigation of the feeding habits of both adult and larval *Pachysimæ* in *Barteria* will be the most important problem to be studied in the future. In this connection, it may be well to note a peculiarity to which my attention was directed by my friend, Mr. J. P. Chapin, during our stay at Avakubi in January, 1914. When *Barteria fistulosa* inhabited by *Pachysima* occurs in rather dense forest, one frequently notes about its base an open patch, fifteen to twenty feet in diameter, where most of the heavy undergrowth has been cleared away. Only a few, low herbaceous plants and often also the slender leaf-stalks of the common marantaceous forest reed, *Sarcophrynium Arnoldianum* De Wildeman, are left standing. The ground at the foot of the tree is partly covered with fallen leaves and dead branches of the *Barteria*. One can always find a few *Pachysima* workers running over this open space, for a purpose unknown to me, perhaps in search of insects which may form part of their diet.[1] I merely venture the supposition that the ants themselves are instrumental in preventing the growth of heavy vegetation near the base of their shelter, perhaps by nipping the tender shoots of the young plants.[2] One can readily imagine that such a clearing would be of use to the ants in their hunts for other insects, making the capture of their prey so much easier and quicker. Incidentally, *Barteria* too may be benefited, since it is saved competition with more vigorous species of trees or shrubs, which, if allowed to thrive near its trunk, would soon interfere with its growth. The shade given by *Barteria fistulosa* is so slight that this factor alone could not account for the absence of woody vegetation within a radius of six to eight feet from its base.[3]

As soon as the leaves of *Barteria fistulosa* fall, the branches begin to dry up, but remain on the tree for several weeks before being shed as described above. Then, however, they are not occupied by the *Pachysimæ*, which pay no further attention to them, one proof more of the strict, obligatory relations existing between these ants and the host plant. The empty, dried swellings may be temporarily occupied by other, small species of ants. At Barumbu, in October, 1913, I came across a *Barteria fistulosa* whose living branches were inhabited by *Pachysima æthiops*, while the dead twigs, still attached to the tree, contained small colonies of a *Crematogaster*. These little ants were apparently not molested by their large neighbors, but, when the tree was disturbed, they remained safely inside, while the *Pachysimæ* rushed forth and ran feverishly over the plant.

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[1] My observations do not agree on this one point with those of Father Kohl, who believes that *Pachysima* never leaves *Barteria* "since they do not undertake hunting parties for strange insects."

[2] With regard to this interesting point I quote the following passage from Kohl's paper (1909): "Some natives assured me that the *Sima* (= *Pachysima*) occasionally trim to half its height the low vegetation which surrounds their host plant. I once observed similar, partly cut low plants in the vicinity of my Mission, but I did not guess the possible agent of this."

[3] Ule (1907, p. 131) also remarks that *Pseudomyrma dendroica* Forel and *P. triplaridis* Forel, which live inside stems and branches of *Triplaris Schomburgkiana* along the Juruá River, Brazil, run down to the ground, where in a circle a few meters wide no other vegetation is allowed to grow.

The myrmecophytic nature of *Barteria fistulosa* was first recognized by K. Schumann (1890, p. 121, footnote) on herbarium specimens collected in Cameroon. Some of the swellings cut open by him still contained a few *Crematogasters*. Its relations with ants were studied in the field by A. Dewèvre (De Wildeman and Durand, 1901, p. 98), Émile Laurent (De Wildeman, 1906, pp. 250–258), H. Winkler (1906, p. 59), and H. Kohl (1909, pp. 97–108). Mention is made in Prof. Wheeler's Report (p. 114) of some of these earlier observations which agree in most details with my own.

The following ants have been found thus far in the swellings of *Barteria fistulosa*, but the two species of *Pachysima* alone can be regarded as obligatory guests of the plant. The others are all accidental tenants which nidify in other places also; they are usually met only on plants or in branches which for some reason or other have been left by the *Pachysimæ*.

Pachysima æthiops (F. Smith). The large, black ant which is the regular inmate of *Barteria fistulosa*, was first collected in this plant by Father Kohl, near Stanleyville (1909, p. 106), and sent by him for identification to Forel (1916, p. 403). Both Mr. Lang and I commonly found the same species at Medje, Ambelokudi, Barumbu, Avakubi, etc.[1] The scale insect *Stictococcus formicarius* Newstead was found by Kohl near Stanleyville with these ants (Newstead, 1910, p. 19).

P. latifrons (Emery). Specimens of this species obtained by Mr. H. Lang at Niangara were probably taken from *Barteria fistulosa*.

Tetraponera anthracina (Santschi). Near Stanleyville (H. Kohl; see Forel, 1916, p. 403). I found several workers of this species at Thysville (June 1915) running over the leaves and twigs of a *Barteria fistulosa* whose swellings were free of ants; I did not find their nest.

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[1] *Pachysima æthiops* was originally described from South Africa, without indication of collector. No species of *Pachysima* has since definitely been recorded from that part of the continent. Since the genus is restricted to *Barteria* and *Myrmæcia*, which are not known to occur south of 7° S. lat., there is a question whether Smith's type was wrongly labeled. It is, however, not so clear how he could have received West African specimens of *P. æthiops* at a time (1877) when hardly any myrmecological collections had been made in Equatorial Africa. I am rather inclined to believe that Smith's type was obtained in the forests of Natal from a myrmecophyte which has since escaped notice.

T. mocquerysi (Ern. André). Near Stanleyville (H. Kohl; see Forel, 1916, p. 403).

T. oberbecki (Forel). Leopoldville (H. Kohl; see Forel, 1916, p. 403).

T. ophthalmica (Emery). Stanleyville and Bengamisa (H. Kohl; see Forel, 1916, p. 403). I collected workers of this ant at Thysville, together with *T. anthracina*, as mentioned above.

T. prelli (Forel) variety *odiosa* (Forel). Belgian Congo (H. Kohl; see Forel, 1916, p. 403).

Crematogaster excisa subspecies *impressa* (Emery). Discovered by Kohl (1909, p. 103, footnote) in branches of *Barteria fistulosa* collected by Ém. Laurent at Isangi. Also near Stanleyville (H. Kohl; see Forel, 1909*b*, p. 69).

C. impressiceps (Mayr). Taken from hollow twigs of *Barteria fistulosa* by Mr. H. Lang at Panga.

C. striatula Emery. Romée near Stanleyville (H. Kohl, 1909, p. 167).

ECOLOGY OF *Barteria Dewevrei*

This species is less common than the preceding and has been but little studied so far. The following notes were made on specimens I found near Leopoldville, in one of the small patches of forest which are scattered through the savannah of that region (March, 1915) and also in a forest gallery along one of the small affluents of the Congo (May, 1915). In that locality, it is a low tree, rarely over 6 meters high, with a straight, simple, or feebly ramified trunk, 20 cm. thick at the base. The alternate leaves are more elongate-elliptic than in *B. fistulosa*, being as much as 40 cm. long and 9 cm. wide. The lateral branches on my specimens were all alike, feebly branching and irregularly spreading, giving the tree a very different appearance from that of the species just mentioned. The specimen collected in May was in flower.

There were no swellings on any of these plants from Leopoldville, but all the lateral branches (Fig. 87*a*-*b*) were hollowed out almost their entire length, each with one continuous cavity. Only the upper extremity of young branches was still filled with green, soft pith, which seems to dry up very soon, as the pith channel is hollow 6 cm. from the tip. A few entrances to the inner cavities had been pierced, mostly on the upper side of the branch, at intervals of about 6 to 14 cm. from one another, usually a short distance above the insertion of a leaf.[1]

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[1] One of the specimens of *B. Dewevrei* from Leopoldville answered well the description given by Ém. Laurent, of a plant which he found at Dima, along the Kasai: "Branches latérales ramifiées, ce qui donne à l'arbre de 6 ou 7m. de haut, un tout autre aspect (que chez *B. fistulosa*); ces branches de 3 à 4 cm. de diamètre sont habitées par des fourmis et leur canal médullaire de 3 mm. de diamètre, resterait après 3 ou 4 ans de végétation toujours habité par des fourmis noires très petites. Beaucoup de rameaux sont perforés seulement au sommet et les fourmis en habitent surtout la région terminale. Les feuilles, largement ovales, luisantes sur les deux faces, ont un pétiole de 10 à 15 mm. de long, le limbe mesure de 30 à 36 cm. sur 14 à 16 cm. et porte 10 paires de nervures latérales" (De Wildeman, 1906, p. 250). Laurent believed that this plant was a species of *Barteria*, but this was doubted by De Wildeman.

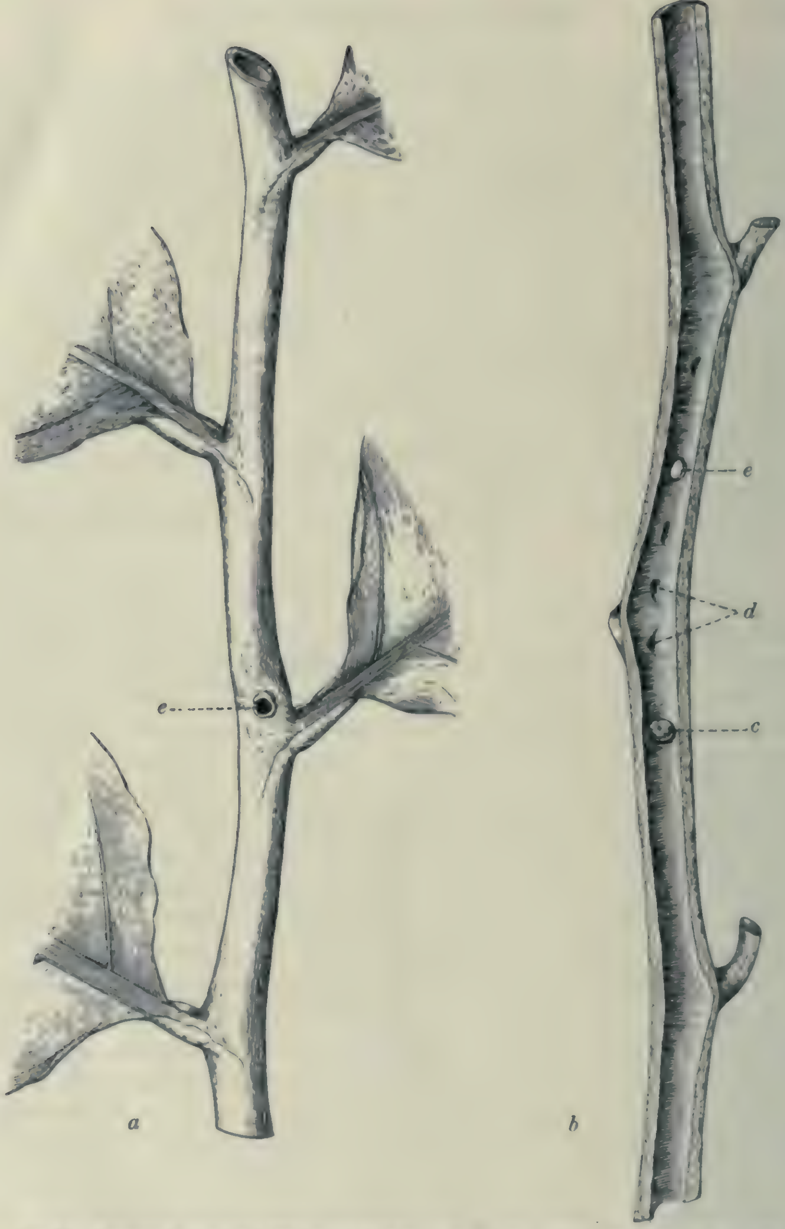

Fig. 87. *Barteria Dewevrei* De Wildeman and Durand: *a*, external view of portion of lateral branch inhabited by ants; *b*, longitudinal section of this branch, showing a coccid (*c*) fixed on inner wall and small depressions (*d*) in which scale insects are often found; *e*, orifice leading into the domatium. Drawn from life at Leopoldville, March, 1915; natural size.

The hollow branches of the two specimens of *B. Dewevrei* examined contained colonies of *Crematogaster africana* variety *schumanni* (Mayr), with a queen, workers, and brood; also some coccids which were usually in a small, scar-like depression in the wall. In one tree some of the branches contained insect larvæ, a lepidopterous pupa, and an adult beetle, but these were in cavities quite separate from those inhabited by ants.

Dewèvre, who discovered this species in the Bangala region, on the Upper Congo, mentions finding ants in its hollow branches (De Wildeman and Durand, 1901, pp. 97–98). A few notes on its relations with ants were also made by Ém. Laurent (De Wildeman, 1906, pp. 247–250) and H. Kohl (1909, pp. 108–109). The following ants have been found in its myrmecodomatia:

Pachysima æthiops (F. Smith). Dima (Ém. Laurent; see H. Kohl, 1909, p. 108); Yalutcha and Yanonge (H. Kohl, 1909, p. 108).

Crematogaster africana (Mayr) variety. Dima (Ém. Laurent; see H. Kohl, 1909, p. 108).

C. africana variety *schumanni* (Mayr). Leopoldville (J. Bequaert).

Apocynaceæ

EPITABERNA K. Schumann

Epitaberna K. SCHUMANN, 1903, Engler's Bot. Jahrb., XXXIII, 2, p. 316.

"A bush with branches thickened and hollow below the nodes. Leaves large, short petiolate, lanceolate, short acuminate. Flowers diclinous, showy, axillary; their pedicel with a pair of lower bracteoles, simulating interpetiolar stipules, and also with a second pair of bracts below the ovary. Sepals large, foliaceous, subinequal, alternating with very large, linear, solitary glands. Corolla very large, infundibuliform; its lobes ample, curled along the margin, their sides in the bud inflexed and covering each other dextrorsely; its throat with variegated hairs. Stamens inserted near the throat, without any stiff appendage at the base, acute and not appendiculate at the apex. Ovary perfectly inferior, pentapterous, 2-celled; with numerous ovules inserted on a thickened placenta; disc annular; style thickened and bilobed at the apex. Fruit unknown.

"Only one species is known.

"The genus is a relative of *Tabernæmontana*, from which it differs in its completely inferior ovary and in the large sepals" (K. Schumann, 1903).

This is the only genus of the large family Apocynaceæ which has thus far been recognized as a myrmecophyte and the true nature of its relations with the ants has apparently not been further investigated on living specimens. It contains only one species.

Epitaberna myrmœcia K. Schumann

Epitaberna myrmœcia K. Schumann, 1903, Engler's Bot. Jahrb., XXXIII, 2, p. 317.

"Branches thickened at the nodes, quadrangular, glabrous. Leaves short petiolate, lanceolate, ample; short and sharply acuminate, acute at the base, glabrous above; slightly hairy on the under side in youth and later on with scattered pile on the midrib. Flowers short pedunculate. Ovary glabrous. Sepals lanceolate, acuminate, large, glabrous. Corolla with a tube extending hardly beyond the calyx; glabrous outside; densely villose at the throat on the inner side; the lobes broadly elliptic, acuminate, curled along the margin, twice the length of the tube, lanceolate in the bud. Stamens linear, enclosed. Style glabrous, filiform, thickened at the apex.

"The flowering branches, 15 cm. long, are 2 mm. thick in the middle of the internodes; the upper part of the internodes is swollen into a spindle-shaped cavity with thin walls, which is as much as 5 cm. long and 9 mm. in diameter and serves as a myrmecodomatium. The heavy, glabrous petiole is grooved on the upper side and at most 5 mm. long. The blade has a length of 11 to 28 cm. and a greater width of 5.5 to 11 cm. in the middle; it is crossed on each side of the midrib by 6 to 10 stronger veins, which are prominent on both sides; in dried condition it is dark green above, pale green below. The flowers do not always present an ovary, there being male and female flowers; but otherwise they do not differ from each other. The peduncle is 5 mm. long, and the inferior ovary about the same length. The green sepals reach a length of 2.5 cm. The tube of the white corolla, with its chrome-yellow throat, is 2.2 cm., and its lobes 5.5 cm. long. The stamens are inserted at 15 mm. above the base of the corolla; the anthers are 7 mm. long. The style measures 1.3 cm.

"The plant is remarkable, representing a new case of myrmecophily. I myself have collected the ants from the wool of the throat of the corolla. This is the first case of completely epigynous flowers among the Apocynaceæ; accordingly the fruit is probably also syncarpous" (K. Schumann).

Cameroon: Bipindi (Zenker).

Epitaberna myrmœcia probably occurs throughout the forest of southern Cameroon and Spanish Guinea. According to Stitz (1910, p. 131), Tessmann found inside the caulinary swellings of this plant, the large *Pachysima æthiops* (F. Smith) (=*spininoda* André) which the Pangwe call "engunkun," much fearing its sting in the belief that it causes fever.

Tessmann, in his account of the Pangwe of southern Cameroon and Spanish Guinea, describes how the tribe uses this myrmecophyte in one of their religious ceremonies. During the initiation to the "Sso-cult" ot the Yaunde, the candidates are obliged to pass for several days through a succession of tests, one of which is as follows. Nests of stinging ants, especially those of *Plagiolepis carinata* Emery, and branches of *Epitaberna myrmœcia* inhabited by *Pachysima æthiops*, are hung or placed in a low hut built for that purpose near the village. This place soon swarms with ants; pods of *Mucuna pruriens* covered with dangerously itching hairs are also thrown inside. The neophytes are then brought there and, after being much frightened by howling and threats, are forced to crawl in succession through the ant-hut where they are, of course, fearfully stung.[1]

Verbenaceæ

CLERODENDRON Linnæus

Clerodendron LINNÆUS, 1753, 'Species Plantarum,' Ed. 1, II, p. 637. BRIQUET, 1895, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 3a, p. 174. J. G. BAKER, 1900, in Thiselton-Dyer, 'Flora of Tropical Africa,' V, 2, p. 292.

"Trees or shrubs, sometimes scandent. Leaves opposite, rarely ternately verticillate, entire or toothed. Cymes axillary or terminal, lax or dense. Flowers small or large, various in color. Calyx not accrescent; tube campanulate; lobes 5, equal, longer or shorter than the tube. Corolla-tube cylindrical; lobes 5, obovate, spreading or slightly reflexed, subequal or unequal. Stamens 4, inserted below the throat of the corolla-tube; filaments long, filiform, involute in bud; anthers ovoid or oblong, with parallel cells. Ovary imperfectly 4-celled; cells 1-ovuled; style long, bifid at the apex. Fruit a globose drupe with a fleshy pericarp and 4 smooth or rugose pyrenes. Seed oblong, exalbuminous" (J. G. Baker, 1900).

This is a very large genus, numbering some 200 species and distributed between the tropics in the Old World; over 150 have been described from Africa, 35 of which have been recorded from the Belgian Congo. They are very common at the edges of the forest and along rivers, where the creeping species often are one of the striking elements in the landscape, on account of their beautiful, showy flowers. The species of the savannah are most frequently low shrubs or erect or trailing herbs.

A number of species of *Clerodendron* have been found associated with ants, but the few published observations are too fragmentary to show whether any of the forms are true myrmecophytes. Among the African representatives, *Clerodendron excavatum* É. De Wildeman[2] is myrmecophilous according to certain observers, while others assert that its hollow stems are merely filled with water. At all events, ants were never found inside the stems of that plant.

At Penge, in January, 1914 (Coll. No. 2205), I collected on the bank of the Ituri River in the dense undergrowth of the forest a low bushy *Clerodendron* which may possibly be *C. excavatum* É. De Wildeman. The plant was 3 to 4 m. high and divested of leaves at that season of the year. Some of the branches, however, were covered with numerous, white, showy flowers, obliquely directed downward. No swellings nor domatia could be found, but the internodes of stem and branches were normally hollow, due to the early resorption and drying up of the pith. Many of the hollow internodes contained nests, with a fertile queen, workers, brood, and newly hatched winged sexual forms of a small, unidentified ant. The insects entered and left by a circular entrance pierced through the wall about half-way between two nodes. In certain cases the partition at the nodes had not been removed, whereas in others the entire limb formed one continuous nesting cavity. An internode of one of the living branches was occupied by a nest of a small solitary bee belonging to the genus *Allodape*.

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[1] Tessmann, G., 1913, 'Die Pangwe,' II, pp. 46–47.

[2] Described, 1909, in 'Études Flore Bas- et Moyen-Congo,' III, 1, pp. 132–134, Pl. XI; 1912, ibid., III, 3, p. 468.

In a recent note De Wildeman (1920) directs attention to several African *Clerodendrons* with fistulose stems, such as *C. excavatum* De Wildeman, *C. angolense* Guerke, and *C. cavum* De Wildeman. The last named was described from specimens which I collected in the Savannah country of the northeastern Belgian Congo, near Boga (July 12, 1914; Coll. No. 5002), between Beni and Kasindi (August 9, 1914; Coll. No. 5205), and near Rutshuru (September 4, 1914; Coll. No. 5534). It is a low bush of the open grass-land, with white flowers; I never observed ants living in or on it.

Following the description of his *Clerodendron formicarum*, Guerke mentions that he saw a specimen obtained by Stuhlmann near Bukoba. Ants of the genus *Crematogaster* were living in its hollow stem, the walls being pierced by a circular hole. Guerke, however, was doubtful as to the specific identity of this Uganda specimen and the typical *C. formicarum* from Angola and the Kasai. The latter is a low, semi-herbaceous plant, 25 to 30 cm. high, which, as I have shown elsewhere, is not the myrmecophyte its name would imply. Stuhlmann's specimen from Bukoba was a rather high, much-branched shrub, with smaller flowers and there is a possibility that it belonged to *C. cavum* De Wildeman, collected by me in several near-by localities.

VITEX Linnæus

Vitex (Tournefort) LINNÆUS, 1753, 'Species Plantarum,' Ed. 1, II, p. 638. J. BRIQUET, 1895, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 3a, p. 170. J. G. BAKER, 1900, in Thiselton-Dyer, 'Flora of Tropical Africa,' V, p. 315.

"Trees or shrubs, with glabrous or hairy branches. Leaves opposite, usually compound, digitate, rarely simple. Cymes dichotomous, axillary or forming a terminal panicle. Flowers whitish, yellowish, lilac, or blue. Calyx campanulate or funnel-shaped, 5-toothed or nearly truncate, accrescent. Corolla-tube short or long, subcylindric or funnel-shaped, straight or slightly curved; limb obliquely patent, subbilabiate. Stamens 4, didynamous, inserted in the corolla-tube and usually exserted from it; anther-cells nearly parallel or divergent. Ovary at first imperfectly

2-celled, usually finally 4-celled; ovules solitary, laterally attached; style filiform, bifid at the apex. Drupe with a more or less fleshy mesocarp and a hard, 4-celled endocarp. Seeds obovate or oblong, exalbuminous" (J. G. Baker, 1900).

This diagnosis should be amended to include creepers also. Apart from the myrmecophilous species of the Ituri Forest described below, the creeper form was apparently thus far unknown in the genus. J. Briquet,[1] it is true, incidentally mentions *Vitex pycnophylla* K. Schumann as a creeper, but, so far, I have failed to find a species of that name described.[2]

The genus *Vitex* contains over one hundred species in the tropical and subtropical parts of both hemispheres. A large number of these are found in Tropical Africa, some twenty being recorded from the Belgian Congo. It is rather closely allied to *Clerodendron*, from which it can only be separated with certainty by the structure of the fruit. While in *Vitex* the endocarp of the drupe forms a single 4-celled nutlet, in *Clerodendron* each fruit contains two 2-celled or four 1-celled nutlets. In addition, all known forms of *Clerodondron* have simple leaves, either entire, toothed, or more or less lobed, whereas in *Vitex* compound, digitate leaves are the rule and simple ones the exception.

Two of the African species are definitely known to be myrmecophilous, but probably other tropical members of the genus also have associations with ants.

Vitex Staudtii Guerke

Vitex Staudtii GUERKE, 1903, Engler's Bot. Jahrb., XXXIII, 2, p. 299.

"Tree or shrub[3] with quadrangular branches. Leaves 5-foliolate, with very long petioles; the leaflets petiolulate, obovate, attenuate at the base, with entire margin, ending in a very long apex, rough above, glandular below. Inflorescences terminal, thyrsoidal, loose; peduncles puberulent. Calyx cupuliform, with truncate or obsoletely 5-toothed margin.

"The branches are sharply quadrangular, entirely glabrous, hollow. The opposite leaves are 5-foliolate, with a petiole 10 to 18 cm. long. The leaflets have a petiole of 5 to 20 mm.; that of the median leaflet longer than the others; they are obovate, twice as long as broad on the average, without the apex 10 to 14 cm. long and 5 to 7 cm. wide; narrowed at the base into the petiole; with entire margins; prolonged into a tip which is suddenly constricted at the base and 1 to 3 cm. long; the upper side with very short, scattered, coarse hairs; under side glabrous, but densely covered with minute, golden yellow glands. The thyrsoid inflorescences are terminal, as much as 30 cm. long, very loose with far spreading branches, which are quadrangular like the petioles, and glabrous or with feeble downy hairs toward the apex; the subdivisions of the inflorescence are pseudo-umbels of 6 to 20 flowers. The peduncles are 2 to 4 mm. long, covered with fine downy hair and bear about the middle of their length 2 lanceolate, easily dropped, downy bracts, 2 to 4 mm. long. The calyx is broadly cupuliform, 3 mm. long, with a truncate or very indistinctly 5-toothed margin. The corolla is greenish-white, covered with yellow glands outside, with curved tube.

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[1] In Engler and Prantl, 1895, 'Die Natürl. Pflanzenfam.,' IV, pt. 3a, p. 133.

[2] The name is not recorded in the Index Kewensis nor in any of its Supplements.

[3] "Arbor vel frutex." This should be amended to "creeper." See remarks at end of description.

"The species belongs in the section *Agnus Castus* and more definitely in Briquet's *Terminales*-group. Among related forms, *V. Buchanani* Baker differs in the smaller, hairy leaves; *V. quadrangula* Guerke also is more strongly pilose. *V. thyrsiflora* Baker too belongs in this group, but is known to me only by the description according to which the leaves are pubescent on the under side also and the calyx apparently is more distinctly toothed. The present species is furthermore characterized by being inhabited by red ants; the hollow branches usually show at the nodes the almost circular orifices which are characteristic of so many ant-plants" (Guerke, 1903).

Togo: not rare in the forest (Baumann).

Cameroon: Yaunde (Zenker and Staudt).

Belgian Congo: Northeastern Congo Forest: Avakubi (January 1914; Lang, Chapin, and J. Bequaert; Coll. No. 1803); Medje (July 1914; Lang and Chapin); Penge (January 31, 1914; J. Bequaert; Coll. No. 2216); between Penge and Irumu (village of Nduye, February 20, 1914; J. Bequaert); Kilo (June 30, 1914; J. Bequaert; Coll. No. 4894).[1]

V. Staudtii must also occur in Spanish Guinea, since its peculiar host, *Viticicola tessmanni* (Stitz), was originally found at Alen, Spanish Guinea, by Tessmann.

With the exception of the indication "tree or shrub," Guerke's diagnosis of *V. Staudtii* agrees perfectly with a myrmecophilous creeper obtained by me in the Ituri Forest and of which dried branches were also brought back by Messrs. Lang and Chapin. In the hope of identifying this plant, I have carefully read the numerous published descriptions of African *Vitex* and there is a reasonable certainty that the Ituri creeper is either identical with or very closely allied to *Vitex Staudtii*.[1] The designation "tree or shrub" is, I believe, due to the fact that Guerke based his description on a few herbarium specimens, which gave not the slightest indication that the species was a creeper; moreover, all other members of the genus known thus far are either trees or erect shrubs.

Vitex yaundensis Guerke

Vitex yaundensis Guerke, 1903, Engler's Bot. Jahrb., XXXIII, 2, p. 296.

"Tree, with very long petiolate, 5-foliolate leaves. Leaflets short petiolulate, oblong-ovate, cuneate at the base, with entire margin, very glabrous on both sides. Flower-cymes axillary, with very long peduncles. Bracts linear. Calyx turbinate, 5-toothed, with deltoid teeth. Tube of the corolla hardly raised above the calyx.

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[1] Mr. Chapin informs me that he saw this myrmecophilous creeper also near Ngayu.

[2] The first indications as to the taxonomic position of this curious myrmecophyte were given by Prof. I. W. Bailey, who, from histological examination of the stems, concluded that it belonged to the Verbenaceæ, most probably in the genus *Vitex*.

"A tree 6 to 8 m. high, with quadrangular, glabrous branches. The leaves are 5-foliolate, borne on a petiole 15 to 22 cm. long, which is glabrous with a flattened groove above. Leaflets with a petiole 1 to 2 cm. long; elongate-ovate, narrowed at the base into the petiole; with entire margin; long acuminate, herbaceous, entirely glabrous on both sides. Parallel lateral veins very numerous, as many as 25 on the median leaflet. The median leaflet reaches a length of 24 cm. and a width of 9 cm.; the two lateral leaflets nearest it are a little smaller, reaching a length of about 20 cm.; the two external leaflets are only 14 cm. long and 7 cm. wide, being in proportion broader than the two lateral leaflets. The inflorescences are placed in the axils of the upper leaves and borne on peduncles 16 to 20 cm. long; they are loose, compound double cymes (dichasia) with strikingly long ramifications. The bracts are sessile, linear, long acuminate, with fine downy hair, as much as 15 mm. long on the lower ramifications; shorter on the upper ramifications. The peduncles are 2 to 3 mm. long and covered with fine downy hair. The calyx when expanded is top-shaped, downy, 3 mm. long, 5-toothed; the teeth are triangular with even sides, rather acute, 1 mm. long and about as wide at the base. The corolla has a very thick, glabrous tube, which is only 4 mm. long; the limb is distinctly bilabiate and 5-lobed; the two posterior lobes are ovate, obtuse, downy, 1 mm. long; the two lateral ones have a similar shape and pilosity, but are 2 mm. long; the anterior one is spatulate, somewhat emarginate, 4 mm. long, pilose at the base and on the middle line, otherwise glabrous. The flower is greenish-yellow; the anterior lobe violet.

"The species belongs near the very large leaved *V. grandifolia* Guerke and *V. bipindensis* Guerke, but differs in the squarrose, very loose inflorescences, and also in the remarkably numerous lateral veins of the leaves. The plant is certainly inhabited by ants, as one can conclude from the characteristic circular openings at the nodes of the branches" (Guerke, 1903).

Cameroon: Yaunde (Zenker).

ECOLOGY OF *Vitex Staudtii*

My attention was first called to this remarkable myrmecophyte by my friend, Mr. J. P. Chapin, at Avakubi, in January, 1914. Knowing my interest in ant-inhabited plants, he directed me to a swampy, wooded spot on the banks of the Ituri River, about five miles upstream from that locality, where there were many specimens of a creeper in the undergrowth of the forest. When the stems of this plant were slightly touched or otherwise disturbed, large numbers of slender, reddish ants rushed out of the hollow stalks ready to attack. I later came across the same creeper on several occasions during my travels in the Ituri Forest, and it appears to be fairly common throughout that region. On the other hand, I never saw it along the Semliki River or in the primitive forest between Lake Kivu and the Lualaba.

All the specimens observed by me were growing in very moist places, usually in parts of the forest flooded after heavy rains. The older plants consist of a long, flexible, woody main stalk, about 15 to 20 mm. thick at the base, or occasionally more. This stem begins to branch feebly and irregularly a short distance from the ground and climbs freely among bushes and low trees, sometimes to a height of 8 to 10 meters. Its upper part is much more abundantly ramified and spreads leaves and flowers over the crown of the supporting vegetation. The compound, digitate leaves, of three to five nearly sessile leaflets, are borne on long petioles and placed opposite each other in decussate rows. Young branches and those on the upper part of the plant are quadrangular their whole length, with four slightly convex or nearly flat sides and more or less winged angles. These four winged ribs are continuous along the limb, at the nodes running on both sides of the petioles. Older branches show the ribs much less pronounced, the surfaces between becoming more convex, but often they still possess fairly pronounced wings, which can even be traced along the main stalk. Stem and branches show no sign of swellings. I have never seen the flowers, but the fruit is small, spheroidal, dry, hard, and of a pale orange-yellow color when ripe.

Adult plants were always inhabited by ants, invariably ot the species *Viticicola tessmanni* (Stitz). The insects enter and leave their nests through a few orifices arranged in pairs at the nodes, nearly opposite each other and between the points of insertion of the leaves (Fig. 88*a*). The aperture, usually more or less crater-shaped, is placed at the top of a slight elevation which is produced by a peculiar ring of sclerenchyma, as shown by Prof. Bailey (see Part V, p. 591). On examining a very young specimen of this *Vitex* still free of ants, I was unable to find a depression, elevation, or scar on the surface to indicate the points where the insects would later gnaw entrance holes. Prof. Bailey's histological study shows that the most favorable situation for the nodal apertures is midway between the points of attachment of the leaves (see Part V, p. 592). The location of exits in *Vitex Staudtii* compares to a limited extent with that in *Cecropia adenopus*, in which, however, the entrances are always pierced above the axils of the leaves but in a section of the stem which is practically devoid of tough tissues (Schimper, 1888). In *Cecropia* the location of this diaphragm of softer tissues is marked externally by a roundish depression or prostoma, at the upper end of a shallow groove running upward from the insertion of the petiole; the ants of *Cecropia* always locate the entrance to the hollow stems in the depressed prostoma. How in *Cecropia*, *Vitex Staudtii*, and other similar cases the ants discover the spots particularly favorable for apertures and why they practically restrict their attacks to these parts of the stem are questions which cannot be satisfactorily answered at present. It

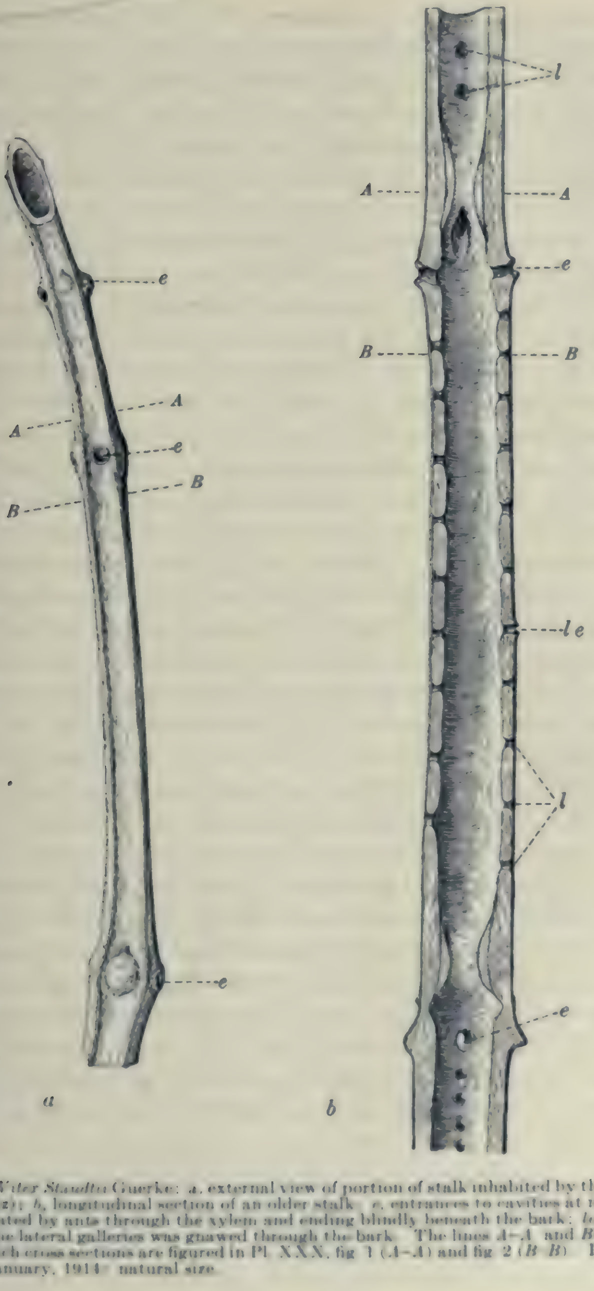

Fig. 88. *Vitex Staudtii* Guerke: *a*, external view of portion of stalk inhabited by the ant *Viticicola tessmanni* (Stitz); *b*, longitudinal section of an older stalk. *e*, entrances to cavities at nodes; *l*, lateral galleries excavated by ants through the xylem and ending blindly beneath the bark; *le*, accessory exit where one of the lateral galleries was gnawed through the bark. The lines *A–A* and *B–B* indicate the levels from which cross sections are figured in Pl. XXX, fig. 1 (*A–A*) and fig. 2 (*B–B*). Drawn from life at Avakubi, January, 1914; natural size.

has been suggested (Wheeler, 1913, p. 136) that ants may be able, through their extremely delicate tactile (or rather chordonotal) sense-organs, to select the thinnest spot in the wall of a cavity for perforation. Their sense of smell may also warn them against gnawing parts of the stem containing certain distasteful substances.

A longitudinal section of the stalks (Fig. 88*b*) discloses many features of further interest. In the first place, adult plants occupied by an ant colony are hollowed out nearly from top to bottom, all the internodes and various branches freely communicating with one another. The entire plant shelters one ant community, containing, in addition to one or more deälated queens, a number of fertile, ergatoid, wingless females. The formicaries of *Viticicola tessmanni* in the stems of *Vitex Staudtii* are thus splendid examples of polygynous insect societies. As in the case of *Pachysima* colonies in *Barteria*, they probably originate through secondary pleometrosis, or subsequent fusion of several isolated colonies, each started by a fecundated queen in the various limbs. A young specimen of *Vitex Staudtii*, scarcely 1 m. high, growing near the village of Nduye, between Penge and Irumu, was particularly instructive in this connection. Each of the lower internodes on the side-branches was occupied by a fertile, deälated female of *Viticicola tessmanni*, together with brood at various stages of development; no workers were present.

The ants clean out most of the medullary tissue nearly the entire length of the internodes, leaving only a peripheral layer of it for a short distance a little above the node. This remaining pith partly constricts the cavity and is probably left to keep the brood of the ants from dropping below the node, thus helping to distribute it regularly over the various internodes of the vertical stems and also preventing it from obstructing the apertures at the nodes. On a level with this inner circle of tissue the walls of the stem are also slightly thicker than in the other parts of the internode. At Kilo, in June, 1914, I saw a very young *Vitex Staudtii* composed of an unbranched, leaved, erect, thin stem about two feet high and unoccupied by ants. The central cylinder of the whole plant was filled with soft medullary tissue. It is possible that this substance dries up by itself, causing the stems to be hollow without the intervention of ants. In nature, however, this must be rarely the case, for, in adult plants housing a colony of *Viticicola*, pith is found only in the topmost internode of very young branches which are still green and soft; the ants steadily work upward through the nodes and excavate the interior before it has begun to dry.

The inner walls of the hollow stalks also show a peculiar series of depressions or narrow channels, the like of which is not known for any other myrmecophyte. These lateral cavities perforate the xylem and end blindly just under the cambium; they are arranged at irregular intervals, one above the other, in two longitudinal rows. The rows are opposite each other and their position shifts at every node, so that they always run on the sides corresponding with the upper pair of apertures of every internode. The number of channels in a row varies with the length of the internode, in some cases there are fifty or more, but often fewer. It occasionally happens that one of these lateral galleries perforates the bark, and this supplementary exit hole then produces the same projecting ring of sclerenchyma which surrounds the normal, crater-like apertures at the nodes. Since no trace of lateral cavities is found in young internodes where the pith has not yet been removed by the ants, we must conclude that they are excavated by the workers of *Viticicola*. They are not used by the inmates for their eggs or very young larvæ. Coccids are not found in these channels and, furthermore, are absent from the hollow stalks of *Vitex Staudtii*. It was at first believed that the channels assist in the aëration of the hollow interior, but this is disproved by Prof. Bailey (see Part V, p. 586). He found that the bark outside the depressions presents no lenticels or patches of aërenchyma for the exchange of gases. On the contrary, the overlying tissues are compact and, in old stems, there are disks of impervious sclerenchyma located just opposite the blind ends of the cavities. Moreover, Prof. Bailey discovered that the channels are not natural gaps in the woody portion of the wall, but are excavated by the ants in peculiar cores of delicate, unlignified cells, that are symmetrically distributed in certain radii of the stem and surrounded by abnormal tissues similar to those presented by heteroplasmatic zoocecidia. The arrangement of the galleries in two rows below the apertures of the upper node results from the fact that in *Vitex Staudtii* the principal water-conducting passageways in each internode are largely confined to those sides of the stele which pass out to the leaves at the next (higher) node. The lateral cavities are excavated in the sides of the stele poorly supplied with vessels and, furthermore, located in those portions of the xylem which are devoid even of a narrow fringe of small primary tracheæ.

Prof. Wheeler has given a detailed description of *Viticicola tessmanni* (Stitz), the obligatory guest of *Vitex Staudtii*, in its various adult phases and larval stages. My observations in the field furnish no clue as to the possible food of these insects, but the ants are evidently adapted to their life within the cavities. Owing to the fact that the plant grows in swampy places, I am inclined to believe that the ants seldom, or never, leave their host. Wheeler and Bailey's examination of food-pellets dissected from the infrabuccal pockets of the adults and the trophothylaces of the larvæ failed to reveal traces of food from an outside source. The insect substances in the pellets of the larvæ resembled the yolk of ants' eggs and the fat-body of the larvæ themselves, suggesting that some of the brood had been used as nourishment for the more vigorous progeny. In one instance pieces of the skin of a *Viticicola* larva could be clearly recognized. There were also spores and bits of hyphæ in many cases and particles that seemed to be pith and callus tissue (Wheeler and Bailey, 1920, p. 261). Bailey thinks that the principal food of *Viticicola tessmanni* is provided by the medullary tissue of young twigs and the "nutritive layer" which is produced in the lateral galleries of the domatia (see Part V, p. 606).

Viticicola tessmanni is exceedingly vicious and alert. When its host plant is ever so slightly disturbed, the workers rush out of the hollow stalks in large numbers and actively explore the plant. Their sting is extremely painful and sometimes produces vesicles on the skin. It is certain that they constitute a very efficient body-guard of their host. Yet, on one occasion, I observed galls on the leaves of a *Vitex* occupied by the ants.

Rubiaceæ

In Africa, as elsewhere, this family is the richest in myrmecophytes, and without doubt the list of its species which form cœnobiotic associations with ants will be considerably increased by future investigation. Unfortunately many of the genera contain a large number of closely allied forms and even the generic distinctions are often unsatisfactory. It is, therefore, urgent that field-observations on these plants be accompanied by complete and abundant herbarium specimens for later identification by botanical experts.

So little is known about the two following cases that I have not treated them in the same detail as true myrmecophytes.

Grumilea venosa Hiern

Grumilea venosa Hiern, in Oliver, 1877, 'Flora of Tropical Africa,' III, p. 217. De Wildeman and Durand, 1901, 'Reliquiæ Dewevreanæ,' p. 130. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 280. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 167.

Specimens collected by Dewèvre in the Belgian Congo (Leopoldville; Bokakata) bear the following note: "Arbuste de 2 m. environ, toujours habité par de nombreuses fourmis noires." (De Wildeman and Durand, 1901, p. 130).

Uragoga species ?

In the forest bordering one of the affluents of the Congo near Leopoldville, I came across a semiherbaceous, low bush, which I provisionally refer to the genus *Uragoga* (May 18, 1915; Coll. No. 7656). The flowers are white, with greenish spots on the teeth of the corolla; the fruit is a red berry. At each node, between the points of attachment of the leaves, there are two curious, persistent stipules, occupying the entire width of the stem (Fig. 89). They are convexly swollen to the upper side and the free margin is recurved downward, the whole forming an inverted cup or pouch broadly open below. Coccids were usually found inside this cavity and the ants, *Crematogaster striatula* variety *obstinata* (Santschi), had built a tent of vegetable material over the inferior opening of the stipules. I did not find eggs, larvæ, or pupæ of these ants inside the stipules, which I therefore regard not as myrmecodomatia but merely as "kraals" to shelter the scale insects. Yet this case suggests useful comparison with the stipular pouches of *Macaranga saccifera* and other more typical ant structures of plants.

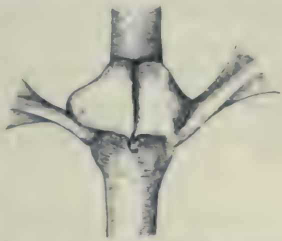

Fig. 89. *Uragoga* species? Swollen stipules at base of a pair of leaves; drawn from life at Leopoldville, May, 1915; twice natural size

UNCARIA Schreber

Uncaria SCHREBER, 1789, in Linnaeus 'Gen. Plant.,' Ed. 8, I, p. 125. HIERN, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 41. HAVILAND, 1897, Journ. Linn. Soc. London, Botany, XXXIII, p. 73.

Ourouparia AUBLET, 1775, 'Histoire des Plantes de la Guiane française,' I, p. 177, Pl. LXVIII. K. SCHUMANN, 1891, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 57.

Agylophora NECKER, 1790, 'Elementa Botanica,' I, p. 145.

Climbing shrubs with opposite, interpetiolar, fugacious stipules; the lower part of the terminal branches with axillary recurved hooks, often spirally rolled up and placed opposite each other; in some cases these hooks still bear a few aborted, opposite leaves. On older branches the recurved hooks are often replaced by heavy, woody thorns. Leaves usually leathery, rarely herbaceous; the stipules entire or bifid. Flowers pedicelled or sessile, crowded into loose, globose heads, without intervening bracteoles. Flower heads placed in the axils of the upper leaves, either singly or in decussate panicles. Calyx salver-, or bell-, or funnel-shaped; the calyx-tubes not cohering, finally fusiform; the limb campanulate, 5-lobed or 5-partite. Corolla often silky outside, funnel-shaped with an elongated tube; the lobes overlapping one another in the bud; throat of the tube bare. Stamens 5, inserted at the throat of the corolla; filaments short; anthers short oblong, the thecæ more or less extended or in some species setose at the base. Disk inconspicuous. Ovary fusiform, 2-celled; style exserted far beyond the tube of the corolla, ending in a clavate or capitate stigma. Ovules numerous, ascending, inserted on a placenta which is borne by the middle partition of the ovary. Fruit a septicidal, many-seeded capsule; testa of the seeds extended at both ends into capillary appendages.

Uncaria is a close relative of the East Indian *Nauclea*, differing mainly in the characters of the fruit, which in the last-named genus is a capsule, not septicidal, but merely breaking up into two cocci or lobes. All the species of *Uncaria* are climbing shrubs found in the forested areas of the tropics. Over thirty species are known, most of them from tropical Asia; two occur in South America and one in Africa.

Uncaria africana G. Don

Uncaria africana G. Don, 1834, 'General System of Gardening and Botany,' III, p. 471. Hooker, 1848, 'Icones Plantarum,' VIII, Pl. DCCLXXXI. Bentham, 1849, in Hooker, 'Niger Flora,' p. 381, Pl. XLII. Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 41. Haviland, 1897, Journ. Linn. Soc. London, Botany, XXXIII, p. 76. É. De Wildeman and T. Durand, 1900, Bull. Herbier Boissier, (2) I, p. 25; 1901, 'Reliquiæ Dewevreanæ,' p. 106. É. De Wildeman, 1903, 'Études Flore Bas- et Moyen-Congo,' I, p. 76; 1907, ibid., II, pp. 71 and 192. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 241. É. De Wildeman, 1910, 'Études Flore Bas- et Moyen-Congo,' III, pt. 2, p. 283; 1912, ibid., III, pt. 3, p. 484.

Nauclea africana Walpers, 1843, 'Repertorium Bot. Syst.,' II, p. 512 (*nec* Willdenow).

Ourouparia africana Baillon, 1879, Bull. Soc. Linn. Paris, I, p. 228. K. Schumann, 1891, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 57. Hiern, 1898, 'Catalogue Afr. Plants Welwitsch,' II, p. 435.

Uruparia africana K. Schumann, in Engler, 1895, 'Pflanzenwelt Ost-Afrikas,' C, p. 378.

"A glabrous or sparingly pubescent shrub 4 to 40 ft. high. Leaves ovate-oval or lanceolate, acuminate, rounded at the base or nearly so, thinly coriaceous, with 5 to 7 lateral veins on each side of the midrib, shortly petiolate, 2 to 6 by 1 to 4 in.; stipules ¼ to ⅓ in. long, usually bipartite with narrow partitions. Spines at first nearly straight, afterwards crooked. Flowering heads 1½ to 2 in. in diameter. Calyx tawny, as well as the corolla shortly and appressedly pilose-tomentose; limb shortly lobed. Corolla about ½ in. long, greenish yellow. Stamens glabrous; anther-cells obtusely produced at base. Fruiting heads 3 to 3½ in. in diameter; pedicels ¾ in. long; capsules ¾ in. long. Tails of the seeds linear-setaceous, undivided at one end, bipartite at the other" (Hiern, 1877).[1]

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[1] Haviland's diagnosis reads: "Frutex 1–15-metr. Ramuli glabri vel pubescentes; internodi 7–9 cm. Folia 13 cm. longa, 6 cm. lata, elliptico-lanceolata, longe acuminata, supra glabra, subtus glabrescentia, nervis 7–8. Petioli 7 mm. Stipulæ bifidæ, lobis acutis. Pedunculi 7 cm., maxime variabiles. Flores pedicellati vel subsessiles. Corolla sericea, mellea; tubus 1 cm., lobi oblongi. Calyx sericeus; tubi pars superior 4 mm.; lobi 1 mm., obtuse triangulares. Stylus 18 mm.; stigma 4 mm., elongato-clavatum. Capsulæ 2 cm., cum pedicellis æquilongæ. Bracteæ nullæ."

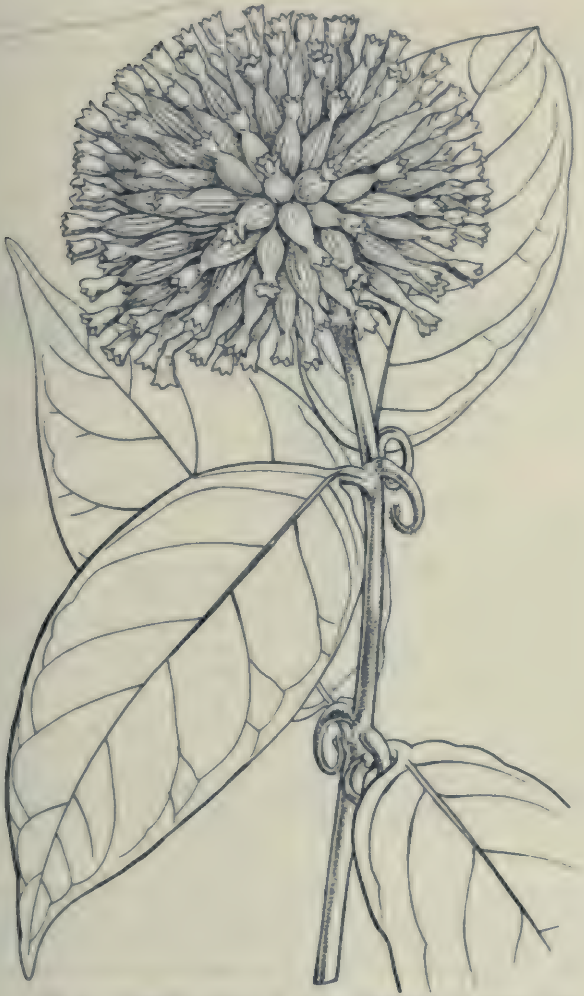


Fig. 90. *Uncaria africana* G. Don. Extremity of branch with capitulum of fruits (after Bentham, 1849).

Sierra Leone, type locality (G. Don; Afzelius; Barter; Scott Elliot; Johnston).

Nigeria (Vogel).

Cameroon.

Spanish Guinea: Rio Muni (Mann).

Belgian Congo: Lower Congo: banks of the Lukungu River (Dewèvre); Kisantu (Gillet); Inkisi River (Vanderyst). Kasai: Linkanda (Gentil). Upper Congo: Mondombe (Jespersen). Northeastern Congo forest: Mangbetu Country (Schweinfurth); Uele region (Seret); Barumbu (November 3, 1913; J. Bequaert; Col. No. 1069); Penge (January 27, 1914; J. Bequaert; Coll. No. 2136); between Penge and

Irumu (village of Tete, February 22, 1914; J. Bequaert; Coll. No. 2658); between Walikale and Lubutu on the Oso River (village of Mandimbo, January 18, 1915; J. Bequaert; Coll. No. 6664).

Uganda.

Angola: Golungo Alto—"in the primitive forests of Sobato de Mussengue" and "in the very dense, primitive forest of Quibanga" (Welwitsch).

Also known from Madagascar and the Comoros.

Haviland distinguishes several varieties:

Variety (1). Flowers subsessile. Upper part of the calyx-tube 4 mm. long. Sierra Leone, Niger, Mangbetu.

Variety (2) *madagascariensis* (*Ourouparia madagascariensis* Baillon, 1879, Bull. Soc. Linn. Paris, I, p. 228). Flowers subsessile. Upper part of the calyx-tube 2 mm. long. Malagasy Region.

Variety (3) *angolensis* Haviland. Flowers pedicellate. Upper part of the calyx-tube 4 mm. long. Angola.

Variety (4). Flowers pedicellate. Upper part of the calyx-tube 2 mm. long. Cameroon.

The variety *angolensis* Haviland is described more in detail by Hiern (1898) as follows:

An arborescent shrub, glabrous except the inflorescence. Trunk in some cases more than 100 ft. long and 6 in. in the lower part, climbing to a very great height and then hanging down; branches patent, fuscous, rather glossy, tetragonal. Leaves opposite, elliptical, narrowly acuminate at the apex, obtusely narrowed or nearly rounded at the base, thinly coriaceous, glossy, dark green above, paler beneath, 2 to 4 ½ in. long, ½ to 1 ⅔ in. broad; lateral veins about 6 on each side of the midrib, slender; petiole ⅛ to ¼ in. long. Stipules ovate, small, somewhat hairy on the inner face, nearly deciduous. Spines axillary, mostly crooked, ¼ to ¾ in. long. Flower heads terminating the branches, shortly pedunculate, globose, about 2 in. in diameter. Flowers golden-tawny, about ¾ to ⅞ in. long (including the exserted style), very numerous, crowded. Pedicels about ⅛ to ⅙ in. long in flower, ⅜ in. long in fruit, tomentellous. Bracts 0. Calyx silky-tomentellous with short upward hairs, somewhat constricted above the ovary, greenish-fuscous; tube broader than the ovary, campanulate, funnel-shaped, ⅙ to ⅕ in. long, shortly 5-cleft, lobes thickly lanceolate. Corolla ½ to ⅗ in. long; tube slender, except the base clothed outside with downward tawny short silky-tomentose hairs, ⅓ in. long; limb much broader than the tube, hemispherical, ⅕ to ¼ in. in diameter, golden-tawny tomentose outside, glabrous inside, deeply 5-lobed; segments about ⅛ in. long, obovate-oblong, rounded at the apex with an apiculus. Stamens 5, about half as long as the corolla-lobes, glabrous, introrse, inserted on short, flattened filaments at the base of the corolla-limb. Ovary ellipsoidal, tomentose, rather thicker than the base of the calyx-limb, much thinner than the top of the calyx-limb. Style filiform, exserted about ¼ in. beyond the corolla, glabrous below, stigmatose and rather thickened in the upper part towards the clavate stigma. Young fruit subglabrous, about ⅜ in. long, ⅙ in. thick, narrowed at both ends especially towards the base.

This species probably occurs throughout the African Rain Forest. In a recent note, De Wildeman (1919) calls attention to the myrme-

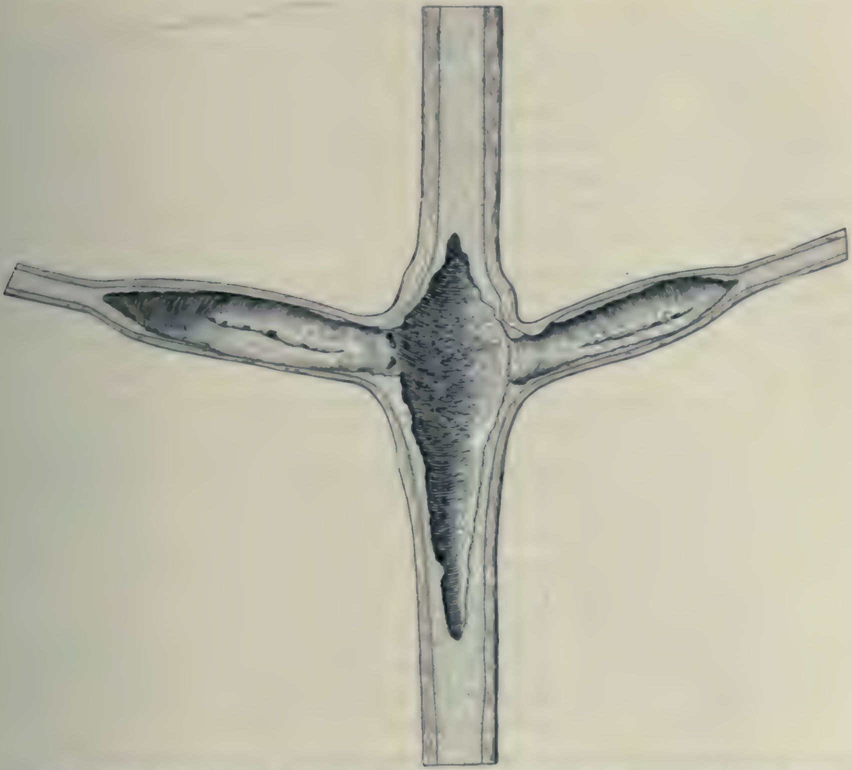


Fig. 91. *Uncaria africana* G. Don. Longitudinal section of myrmecodomatium at a node, showing three cavities communicating with one another; the aperture is not figured. Drawn from life at Barumbu, November, 1913; **natural size.**

cophytism of certain African plants of this genus. He proposes, provisionally, the varietal name *myrmecophyta* De Wildeman for specimens which I collected in the Ituri Forest at Penge and between Penge and Irumu, without, however, giving characters by which this new variety could be differentiated from the typical form. I am inclined to believe that myrmecophytism is normal for *Uncaria africana* throughout its range and has merely been overlooked thus far. When terminal branches alone are collected, there may be no indication of the peculiar myrmecodomatia in herbarium specimens, even should such have been present on lower parts of the plant. Ant-inhabited parts of plants are also frequently avoided by botanical collectors. Moreover, it is possible that the myrmecodomatia are absent or but little pronounced in certain individuals or at certain stages of growth.

ECOLOGY OF *Uncaria africana*

Here (Figs. 90 and 91) we have one of the many climbing bushes or "scramblers"—as Schimper proposed calling them—which frequently form tangles of vegetation over the low trees at the edge of clearings and along river banks. While the trunk and main branches are straight and stiff as in ordinary bushes, all or part of the lateral branches are limp and pliable. The latter either hang down freely or work their way upward, keeping hold of the other trees by means of the spirally curved hooks and woody thorns, which are placed in pairs above the nodes and are evidently modified branches. The leaves are glabrous, as well as the branches at the extremity of some of which the flowers or fruits form head-clusters.

The myrmecodomatium of this *Uncaria* consists of the enlarged and hollow basal internodes of two opposite, lateral branches, the cavities in this pair of swellings communicating with the hollow, very slightly swollen node of the main branch (Fig. 91). The middle chamber is more or less club-shaped, 5 to 6 cm. long and 10 to 20 mm. wide in the upper half; it is dug farther into the pith below than above. The two lateral cavities are 3 to 6 cm. long and 6 to 10 mm. broad.

All the specimens I had opportunity to study in the field were inhabited by ants of the genus *Crematogaster*, which were identified as *C. excisa* subspecies *andrei* (Forel) in the case of the plants found near the Oso River, between Walikale and Lubutu in January, 1915. The myrmecodomatia contained not only the queen, workers, and brood of the ants, but also numerous coccids. These scale insects were invariably located in the lateral swellings and fixed at the bottom of two deep, opposite, longitudinal grooves in the inner wall. One or more circular exit holes are pierced by the ants through the sides of the lateral cavities. Often the depressions occupied by the coccids are open to the exterior by means of irregular slits through which the ants enter and leave. It would thus seem that these grooves are gnawed by the ants, probably on account of some special hyperplasias formed in that region of the walls. The coccids merely select the grooves for nutritive, juicy tissue to be found there and continually renovated by the attacks of the ants.

On the plants examined by me at Barumbu in November, 1913, there were a number of young branches whose basal internodes, though distinctly swollen, were still filled with juicy pith tissue. In another instance, between Walikale and Lubutu, the basal swellings of many older branches were not yet inhabited by ants, presenting no exit holes; nevertheless, they were entirely hollow inside, so that the cavities of

Uncaria originate through the drying up of the pith and without the agency of ants, as I have shown to be the case with the myrmecodomatia of *Barteria fistulosa*.

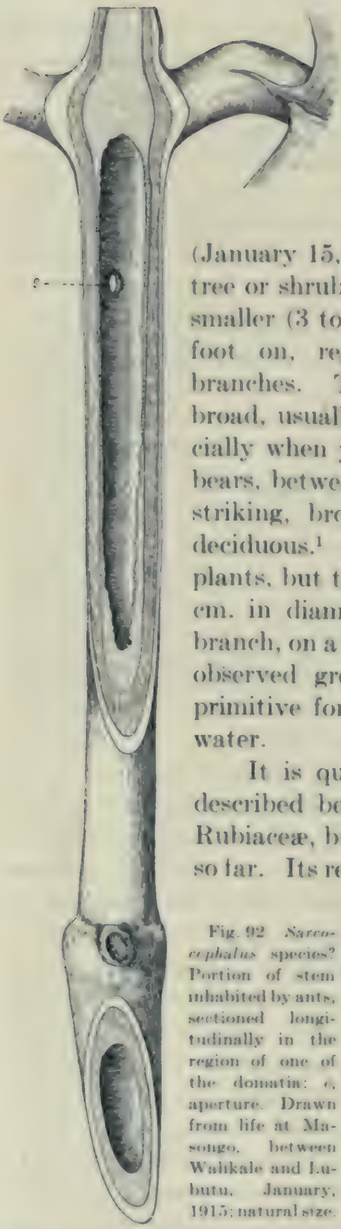
SARCOCEPHALUS Afzelius

Sarcocephalus AFZELIUS, 1818, in R. Brown, Tuckey's 'Narrative Exp. Zaire,' Appendix No. 5, p. 467. HIERN, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 38. K. SCHUMANN, 1891, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 58.

Trees or shrubs with subterete or obtusely quadrangular branches and opposite, subcoriaceous, petiolate leaves (rarely in whorls of three). Stipules interpetiolar and deciduous in the African species, often very large. Flowers whitish, pale pink or yellowish, crowded on globose, common receptacles, forming compact, pedunculate, globose, terminal and axillary heads, without intervening bracteoles. Peduncles of the flower heads with small bracts below the middle. Calyx-tubes cohering, truncate or with 4 or 5 teeth; these teeth hairy, jagged at the tip or in some species with as many alternating appendages. Corolla narrowly funnel-shaped, with glabrous throat, rather fleshy, glabrous or pubescent, 4- or 5-lobed, imbricated in prefloration, deciduous. Anthers 5, subsessile, inserted at the mouth or throat of the corolla, ovate-oblong. Disk inconspicuous. Ovaries grown together, 1- or 2-celled. Style filiform, exserted far outside the corolla, caducous. Stigma oblong or spindle-shaped, thicker than the style, glabrous, entire, emarginate, or bifid. Placentas centrally attached (in the African species). Ovules numerous, anatropous. Syncarpium fleshy, globose, pitted or uneven, its cells with thin walls and divided by membranaceous septa. Seeds small, not winged, ovoid, and placed above one another (in the African species); funicles spongy; testa crustaceous; albumen fleshy.

The members of this genus are usually easy to recognize in the field, especially when in fruit. Haviland in his monograph of the Nauclеæ (1897) recognizes thirteen species in the tropical regions of the Old World. The number of described forms has been considerably increased in later years and must now approximate thirty. Of these six are recorded from Africa and four from the Belgian Congo.

According to K. Schumann (1891*b*, p. 59), *Sarcocephalus macrocephalus*, from the Philippines, has swellings inhabited by ants. Haviland is inclined to believe that the plant in question was a *Nauclea*, a genus known to contain several myrmecophytic species in the Philippines. In the Belgian Congo, however, there is a true *Sarcocephalus* with myrmecodomatia. At present I can not give its specific identity, but it is certainly very distinct from the common *S. sambucinus* (Winterbottom), = *S. esculentus* Afzelius, which, according to my observations, is never inhabited by ants. Most probably it represents a distinct, undescribed form.



ECOLOGY OF *Sarcocephalus* SPECIES

This myrmecophyte was first met with in the Ituri Forest, near the village of Banana between Penge and Irumu (February 24, 1914; Coll. No. 2605) and was again seen near the village of Masongo, between Walikale and Lubutu (January 15, 1915; Coll. No. 6629). It is a low, erect tree or shrub, rarely over 8 meters high, usually much smaller (3 to 4 m.). The straight trunk bears, from its foot on, regularly spreading, opposite, decussate branches. The leaves are opposite, large and very broad, usually purplish-red on the under side, especially when young. The terminal part of the branch bears, between the points of attachment of the leaves, striking, broad stipules which, however, are early deciduous.[1] It never happened that I saw flowering plants, but the fruit is a spheroidal, solid ball, 9 to 10 cm. in diameter, placed at the extremity of a side branch, on a short, recurved pedicel. All the specimens observed grew on swampy, rather open spots of the primitive forest, either at the edge of a brook or in the water.

It is quite possible that this species has been described before, perhaps under a related genus of Rubiaceæ, but it agrees with none of the diagnoses seen so far. Its relation with ants would easily escape notice, for the myrmecodomatia are inconspicuous and, when not actually occupied by insects, could often be discovered only upon sectioning the branches. Externally, they consist (Fig. 92) of a very slight, often imperceptible swelling on the upper half or two-thirds of the internode. Inside, the central cylinder is hollowed out into a spacious cavity, 6 to 8 cm. long and 5 to 7 mm. wide at the top. Domatia inhabited by ants have a circular aperture a short distance below the node.

Fig. 92 *Sarcocephalus* species? Portion of stem inhabited by ants, sectioned longitudinally in the region of one of the domatia: *e*, aperture. Drawn from life at Masongo, between Walikale and Lubutu, January, 1915; natural size.

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[1] In the common African *Sarcocephalus sambucinus* the stipules are small (4 mm. long) and persistent; but they are large and caducous in many other species of the genus.

Sections made of a number of young specimens of this myrmecophyte not yet settled by ants showed that in this case, too, the swollen upper portion of the internodes becomes hollow of its own accord through the drying up of part of the medullary tissue; such cavities have no exit holes. In this species the lower internodes of the main trunk and side branches are neither transformed into domatia nor in the least swollen and remain completely filled with pith. Very young plants show no trace whatsoever of ant-chambers and on an adult tree the size and shape of the myrmecodomatia becomes more pronounced toward the upper branches.

In both localities where I observed this *Sarcocephalus* a number of specimens were inhabited by small ants of the genus *Crematogaster*. Those taken from the domatia of the plants between Walikale and Lubutu were identified by Santschi as *C. africana* subspecies *winkleri* variety *fickendeyi* (Forel), a form commonly found nesting in other places. These insects had established regular colonies in the cavities, with a queen, workers, and brood; coccids were also among them, fixed on the inner walls.

RANDIA Linnæus

Randia (Houston) LINNÆUS, 1753, 'Species Plantarum,' Ed. 1, II, p. 1192. HIERN, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 93. K. SCHUMANN, 1891, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 75.

Erect or scandent, spinous or unarmed shrubs or trees, with opposite or verticillate, often leathery leaves; stipules rather short, solitary, entire, more or less heathlike. Flowers large or medium-sized; solitary, few together, or corymbose; as a rule apparently axillary or terminating short lateral branches, or terminal. Calyx-tube ovoid or turbinate, ribbed or cylindrical; the limb usually tubular, truncate, toothed, lobed, or spathaceous; lobes sometimes foliaceous. Corolla white or yellowish, or more greenish; campanulate, funnel-shaped, or salver-shaped; tube in some species much elongated; limb spreading or reflexed, dextrorsely contorted in the bud. Anthers sessile or subsessile, narrowly linear, inserted at or near the throat or mouth of the corollar tube, included or exserted. Disk annular or cushion-shaped. Ovary 2-celled. Ovules very numerous, immersed in the fleshy placentas. Style strong, glabrous or hairy; stigma club- or clapper-shaped, entire, bidentate or bilobed, sulcate. Berry 2-celled, usually many-seeded; the testa of the seed leathery or membranous.

This genus is close to *Pouchetia* A. Richard and *Oxyanthus* de Candolle; still more so to *Gardenia* Ellis, which it often resembles in general habitus. *Gardenia* has the ovary completely one-celled for the whole length; this character, however, is not always easy to decide upon because in certain species of *Randia*, as, for instance, *R. physophylla*, the ovary is incompletely divided into two cells.

About 150 species have been described, by far the majority being found in the Oriental and Ethiopian Regions and a few in Tropical America. In the Belgian Congo the genus is well represented by some twenty-five species. They are trees or bushes with large, showy flowers, growing mostly in the Rain Forest or in the forest galleries along the streams of the Savannah.

Three of the African species are associated with ants; they all belong to that section of the genus in which the lobes of the calyx are elongate, slender, subulate, and not leaf-like. *R. physophylla* K. Schumann is characterized by the presence of glandular cavities at the base of the leaf-blade (Fig. 94). The two others, *R. myrmecophyla* É. De Wildeman and *R. Lujæ* É. De Wildeman, possess caulinary myrmecodomatia and, in addition, agree in the following characters:

Trees or shrubs with glabrous branches, feebly flattened at the nodes; the internodes often swollen, spindle-shaped; the swellings being hollow, usually pierced by one or more orifices and inhabited by ants; the leaves are opposite, or apparently verticillate, three of them being placed at about the same level; blade obovate, acuminate, constricted at the base into a rather thick, short petiole.

They can be separated as follows on characters mentioned in their descriptions:

Flowers erect, placed by twos or fours in the axils of the leaves, about 22 cm. long; tube of the corolla glabrous externally. Leaves smaller, with acarodomatia in the axils of the lateral veins........................*R. Lujæ* De Wildeman.

Flowers pendent, solitary, terminal, much larger; the corolla alone 22 to 25 cm. long, shortly tomentose externally. Leaves larger, the blade as much as 30 cm. long and 15 cm. broad, without acarodomatia..*R. myrmecophyla* De Wildeman.

Randia Lujæ De Wildeman

Randia Lujæ É. De Wildeman, 1904, C. R. Ac. Sci. Paris, CXXXVIII, p. 914; 1904, 'Notices sur des Plantes utiles ou intér. Flore du Congo,' I, pt. 2, pp. 282-284; 1907, 'Études Flore Bas- et Moyen-Congo,' II, p. 159; 1910, ibid., III, pt. 2, p. 286; 1912, ibid., III, pt. 3, p. 487. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 259. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 155 and 158. É. De Wildeman, 1920, 'Mission de Briey au Mayumbe,' pp. 43, 88, 222, and 264.

"Large tree with glabrous branches, the internodes often thickened toward the base and pierced by one or two orifices leading into a cavity inhabited by ants. Leaves obovate, acuminate, narrowed at the base into a short and rather thick petiole; blade rather coriaceous, darker colored above than below, 20 to 25 cm. long, 5 to 12 cm. broad, glabrous on both sides, with an acumen of 15 mm. Lateral veins numbering about 9 on each side of the midrib, anastomosing into a curve before reaching the margin, little or not prominent above, prominent on the under side; in the axils of the origin of the lateral veins there are acarodomatia excavated in the tissue of the nervure and opening by a pore at the under side of the blade, more or less visible on the upper side as feeble swellings. Flowers by twos, erect, sessile or subsessile, about 22 cm. long; calyx about 17 mm. long, glabrous, with 5 ribs ending in 5 subulate, irregular teeth; corolla with a long linear, glabrous tube, rather abruptly widening in its upper part, the broadened portion about 22 mm. long; ending in 4 ovate-lanceolate, acute lobes of about 3 mm.; glabrous externally, sparsely villous internally. Stamens partly exserted, extending beyond the broadened funnel of the corolla for about 11 mm. Fruit globose, voluminous, over 15 cm. in diameter" (É. De Wildeman, 1904).

Belgian Congo: Kasai: forest along the Sankuru River, type locality (Luja). Middle and Upper Congo: Lukolela (Claessens); Lokelenge (Bruneel); Bianga (Bellefroid). Mayombe: Ganda Sundi (de Briey).

According to De Wildeman (1910, p. 286) the leaves are often placed in verticils of three; the flowers frequently by fours; the fruit is grayish, subspherical, with 5 more or less conspicuous ribs. This species is close to *Randia maculata* de Candolle, =*R. longiflora* (Salisbury), but differs in the presence of acarodomatia in the axils of the lateral veins and the ant-swellings of the internodes.

Randia myrmecophyla De Wildeman

Randia myrmecophyla É. DE WILDEMAN, 1907, 'Études Flore Bas- et Moyen-Congo,' II, pt. 2, p. 160, figs. 5–8, Pls. XXXVIII–XXXIX; 1908, ibid., II, pt. 3, p. 346; 1907, 'Mission Émile Laurent,' V, pp. ccxxiii–ccxxiv, figs. IX, XI.

Randia myrmecophila TH. AND H. DURAND, 1909, 'Sylloge Flor. Congol.,' p. 260.

Randia myrmecophila H. KOHL, 1909, Natur u. Offenbarung, LV, pp. 158–160, fig. 5.

"Shrub with glabrous branches, which are flattened at the nodes, and swollen toward the apex of the more or less lengthened internodes Internodes hollowed over part of their length, sheltering ants and coccids. Leaves opposite or pseudo-verticillate by threes, petiolate; the petiole flattened above. Stipules very broad, triangular, acuminate, about 4 mm. long. Flowers solitary, the calyx with 5 linear teeth. Corolla with a cylindric tube, widened in its upper part, with 5 lobes which are rounded at their apex. Anthers inclosed. Style with a club-shaped stigma, not or little exserted.

"Variety *typica* De Wildeman (1907, p. 160).

"Petiole 15 to 25 mm. long, short tomentose, flat above. Blade of the leaves cuneate at the base, rounded-cuneate at the apex, glabrous above, velutinous-tomentose on the under side, with 11 or 12 lateral veins on each side of the midrib, 20 to 40 cm. long and 9 to 13.5 cm. broad. Calyx short tomentose externally, becoming glabrous with age, densely villose and silky inside; its tube, including the ovary, about 2.5 cm. long, with conspicuous ribs ending beyond the truncate margin in 5 linear teeth, 5 to 13 mm. long. Corolla with its tube 22 to 25 cm. long, shortly tomentose externally; more heavily villose inside, except in its widened, glabrous part which is 9 cm. long; lobes villose on both faces, 5.5 cm. long and of about the same width, partly overlapping in the bud. Fruit ovoid, 10 cm. long, 8 cm. in diameter, with 5 feeble ribs.

"Variety *subglabra* De Wildeman (1907, p. 163).

"Petiole 8 to 15 mm. long, sparsely and short tomentose, flat on the upper side. Leaf-blade rather broadly cuneate at the base, glabrous and shiny above, glabrous and dull on the under side, except on the lateral veins of which there are 12 or 13 on each side of the midrib; 18 to 23 cm. long and 7.5 to 12.5 cm. broad. Calyx short tomentose externally, becoming glabrous with age; densely silky-villose inside; its tube including the ovary about 2.5 to 2.8 cm. long, often split on one side; ribs conspicuous, ending beyond the truncate margin into 5 linear teeth, 16 mm. long. Corolla with a tube of 21 to 22 cm., the lobes about 4 cm. by 4 cm.; the villosity as in the form *typica*.

"Variety *glabra* De Wildeman (1907, p. 163).

"Petiole 15 to 30 mm. long, glabrous. Leaf-blade long cuneate at the base, glabrous on both faces, shiny above, dull below; with about 14 lateral veins on each side of the midrib; 18 to 26 cm. long and 6 to 10.5 cm. broad. Calyx glabrous externally; the tube including the ovary about 2 cm. long (in the bud), the teeth 6 to 15 mm. long" (De Wildeman, 1907).

Belgian Congo: Kasai: Bombaie (É. and M. Laurent). Middle and Upper Congo: Eala, type locality (Pynaert; M. Laurent; variety *typica*); Coquilhatville (M. Laurent; variety *subglabra*). Eastern Congo Forest: Yambuya (M. Laurent; Solheid; variety *subglabra* and variety *glabra*); Avakubi (January 13, 1914; J. Bequaert; Coll. No. 1917).

De Wildeman's figure of a flowering live plant (1907, p. 160, fig. 5) shows that the very large, solitary, terminal flowers are pendent. According to the same author, it belongs to the group of *R. malleifera* (Hooker), which species, however, differs in the absence of ant-swellings, the smaller corolla with much denser and longer tomentum on the tube, and the villosity of the stem.

Randia physophylla K. Schumann

Randia physophylla K. Schumann, 1899, Engler's Bot. Jahrb., XXVIII, pt. 1, p. 64. É. De Wildeman, 1903, 'Études Flore Bas- et Moyen-Congo,' I, p. 81; 1907, ibid., II, pp. 74 and 164; 1912, ibid., III, pt. 3, p. 487. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 260.

"Leaves very short petiolate or subsessile, oblong, short and sharply acuminate, broadly cuneate at the base, subcordate and auriculate below, the earlets excavated and glandular; leaves very glabrous on both sides, resinous and very shiny. Ovary, to judge from the fruit, globose, glabrous and scabrous. Calyx tubular and irregularly 5-lobed, the lobes costate and scabrous. Corolla pentamerous, each of the 5 lobes divided in the upper part into obovate, obtuse, carnose laciniæ. Anthers curved, broad. Style exserted for a long distance out of the corollar tube; subclavate and sulcate in its upper part. Berry globose, crowned by the calyx.

"The petiole is hardly 3 to 4 mm. long. The blade has a length of 30 to 35 cm. and a width in the middle of 12 to 14 cm.; it is crossed on each side of the midrib by 23 to 25 heavy lateral veins, which are visible on both upper and under surfaces; the leaf is shiny chestnut-brown in dried condition. The two semiglobose glandular cups at the base of the leaf are 5 mm. deep. The glands of the stipules must secrete an abundance of resin, for it fairly drenches the leaves and forms a crust at the base of the petiole. The calyx has a length of 3 to 3.5 cm. The corolla is very fleshy, 18 to 19 cm. long, of which 15 cm. is the length of the tube. The stamens are 1.3 cm. long. The style exceeds the corollar tube by about 3 cm. The berry has a diameter of 2.5 cm." (K. Schumann, 1899).

Cameroon: Grand Batanga (Dinklage); Bipindi (Zenker).

Belgian Congo: Lower Congo: Kisantu; Lukaya (Gillet); Sanda (Oddon); Kwango Region (Butaye); Leopoldville (April 15, 1915; J. Bequaert; Coll. No. 7347). Middle and Upper Congo: Ikela (Jespersen); Eala (M. Laurent); Lubi (Leserauwaet).

ECOLOGY OF *Randia Lujæ*

The species was discovered by Luja in 1903 along the Sankuru River in the Belgian Congo. According to De Wildeman (1904*a*, pp. 282–284; 1904*b*) its myrmecodomatia are very similar to those of *R. myrmecophyla* described in detail below. They consist of spindle-shaped swellings of the internodes, about 2 to 3 cm. thick and hollow; one or two apertures, in the widest part of the swelling, lead into the cavity. There are, in addition, on the leaves, in the axils of the nerves acarodomatia in the form of small pouches. The ants found by De Wildeman in the domatia of *Randia Lujæ* have not been identified.

ECOLOGY OF *Randia myrmecophyla*

On only one occasion did I observe this species in the field. At Avakubi, in January, 1914, a specimen was found in the primitive Rain Forest, in a rather dry place. It grew as a bush with very broad and long, glabrous, smooth leaves; the blades were as much as 30 cm. long and 15 cm. wide and borne on a petiole sometimes 4 cm. long. The large, white, pendent flowers were very striking. The plant agreed perfectly in all particulars with De Wildeman's descriptions, photographs, and drawings of *R. myrmecophyla*.

The myrmecodomatia of this *Randia* (Fig. 93) are quite peculiar, being elongate, regular, spindle-shaped swellings on the middle portion of the internode, and extending about half its length. These expansions seem to occur in all the internodes of the various branches, usually present one circular aperture, occasionally two or three, near the middle of one side, and are inhabited by ants. A longitudinal section shows the interior of the enlarged part of the internode to consist of a spacious cavity, 10 to 12 cm. long and 6 to 7 mm. wide, which stops a long distance from the nodes.

The ants I found in the myrmecodomatia of the specimens at Avakubi belonged to a small species of *Crematogaster* recently identified by Santschi as *C. rugosa* (André). Each cavity apparently contained its own formicary with brood, and in many instances was divided into a series of chambers by transverse walls of brown, malaxated pith débris. Sometimes one hollow would thus be separated into four successive compartments communicating by one or two holes pierced through the

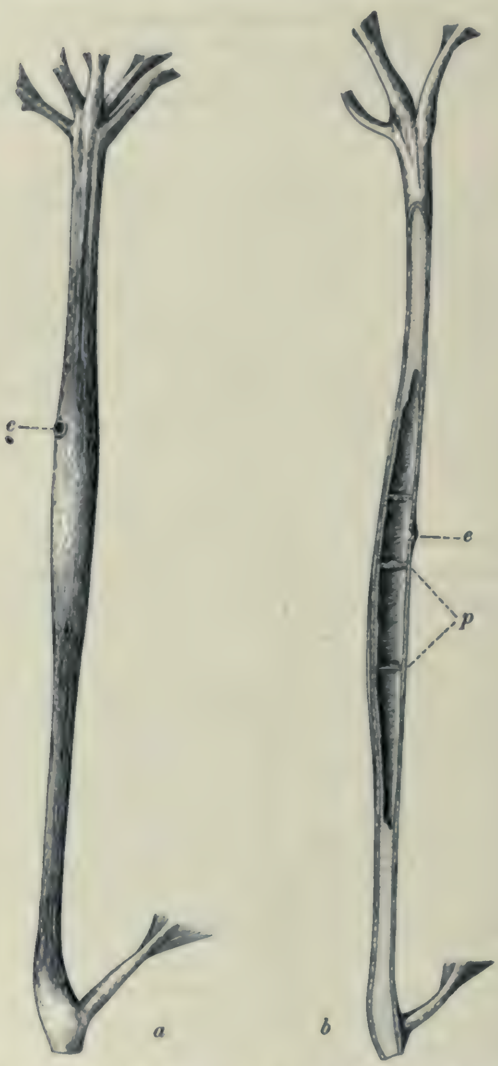


Fig. 93. *Randia myrmecophyla* De Wildeman: a, portion of branch showing swollen internode inhabited by ants; *b*, longitudinal section of this internode; *e*, entrance to cavity; *p*, partitions built by ants. Drawn from life at Avakubi, January, 1914; one-half natural size.

partitions; even then, there would usually be only one external aperture to the domatium. By means of these dividing walls the ants undoubtedly make a much more efficient use of the hollow internodes, for it has been observed that in such cases the larvæ and pupæ are kept toward the nodes in the narrower upper and lower stories. Coccids are also common companions of the ants in this *Randia*.

Crematogaster rugosa is a small and timid ant and probably does not give its host much protection. Even when the branches containing formicaries are shaken, the inmates do not leave their retreats. The specimen near Avakubi, though settled by ants, had its leaves badly eaten by phytophagous insects.

Ém. Laurent, the discoverer of this *Randia*, recognized its myrmecophily in the field. He found an unidentified ant and coccids in the swollen internodes. I am not aware that additional information on this plant has been published since, but Kohl in later years has collected from its domatia specimens of *Camponotus foraminosus* Forel and *Cataulacus weissi* Santschi (Forel, 1916, pp. 427 and 443).

Ecology of *Randia physophylla*

I found a specimen of this species in a forest gallery near Leopoldville, in April, 1915. It was a small tree, with very large leaves, about 46 cm. long and 27 cm. wide, on short petioles (1 cm.). The young leaves, before complete expansion, are viscose, being covered with a resinous, sticky substance. The large, showy flowers are erect; their calyx ends in broad lobes; the corolla, about 26 cm. long, is dirty white in its upper part and greenish white in the tubular, lower portion. The egg-shaped fruit is 6 cm. long without the persistent calyx, 4 cm. thick, and deprived of ribs.

This species has no swellings on its branches and the stem is never hollow nor inhabited by ants. At the base of the leaf-blade (Fig. 94), on both sides of the midrib, there is an evagination of variable size, convex on the upper surface of the leaf, broadly open below. On some blades it consists of a mere inflation of the leaf-base, whereas in others it may be 4 to 6 mm. deep and pouch-like, 5 to 8 mm. long and 6 to 7 mm. broad. In all cases, however, on looking into it from the under side, one finds in the bottom, close to the midrib, a conspicuous pale brown gland which secretes a sweet substance. On some of the leaves of the specimen I examined near Leopoldville, a number of ants, *Crematogaster africana* subspecies *laurenti* variety *zeta* (Forel), had taken possession of these distended nectaria, closing the opening on the under side with a tent of fine, agglutinated, dark brown vegetable fibres. Frequently they were accompanied by coccids. Never having seen queens or brood of the ants in the leaf swellings, I can not regard these structures as forming part of the nest. Ants of the same variety occasionally build fibrous shelters over coccids which are fixed on the fruits of this *Randia*.

From the foregoing it is evident that *Randia physophylla* is not a true myrmecophyte in the sense generally meant by this term. Yet its relations with ants are not without interest, for here we have a primitive stage leading to the production of true ant-pouches such as those of *Scaphopetalum Thonneri*, *Cola Laurentii*, and certain South American Melastomaceæ.

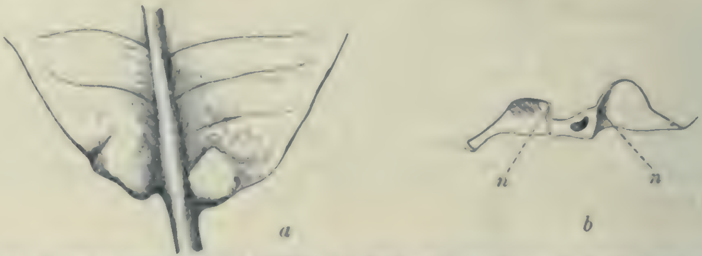


Fig. 94. *Randia physophylla* K. Schumann: a, base of leaf-blade with the two swellings, seen from above, natural size; *b*, cross section of this base, one and one-half natural size; the nectarium is placed in *n*. Drawn from life at Leopoldville, April, 1915.

Plectronia Linnæus

Plectronia Linnæus, 1767, 'Mantissa Plant.,' I, p. 52. K. Schumann, in Engler and Prantl, 1891, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 91.

Canthium Lamarck, 1783, 'Encyclop. Méthod.,' I, p. 602. Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 132.

Shrubs or trees, often climbing or clambering bushes, occasionally spinous, with opposite leaves and branches, and acuminate stipules from a broad, often sheath-like base. Frequently some of the branches are sarmentose, hooked or winding; or the plant emits whip-like shoots, often many meters long, somewhat compressed, leafless or with small leaves, furnished with heavy, more or less recurved spines; these shoots trail along the ground or work their way up the trees. Flowers small, axillary, in dense cymes or umbels, or short panicles or clusters. Calyx-tube short, turbinate, campanulate, or hemispherical; limb short, 4- or 5-toothed or cleft, or subtruncate, deciduous. Corolla coriaceous; tube rather short, exceeding the calyx, glabrous outside, hairy with a ring of deflexed pilose hairs or rarely glabrous inside; throat rather constricted or dilated, often bearded; lobes 4 or 5, rarely 6, ovate or lanceolate, reflexed, usually glabrous, valvate in the bud (toward the apex sometimes induplicate-valvate). Stamens 4 or 5, rarely 6, exserted, inserted at the mouth of the corolla; filaments short; anthers ovate, or oval, or lanceolate, acute or obtuse, usually subsagittate at the base, as a rule glabrous, fixed at the back. Ovary 2-celled, fleshy. Style flexuous, filiform or thickened, exserted or equalling the corolla, usually glabrous. Stigma capitate, calyptriform or mitre-shaped, sometimes bifid at the tip, often sulcate. Ovules solitary, pendulous, orthotropous, the micropyle directed upward. Fruit a drupe, didymous, subdimidiate, or globose, 2-celled or by abortion 1-celled; stones 2 or 1, sometimes subrugose. Seeds pendulous, solitary, nearly straight or curved, sometimes bent into the form of a horseshoe round the placenta; testa membranous; albumen fleshy, sometimes ruminated; embryo cylindrical, nearly straight or curved, axile; cotyledons short, radicle superior.

Plectronia is a close relative of *Vangueria* Jussieu, but the latter has a three- to five-celled ovary and a drupe containing three to five one-seeded stones or consisting of one three- to five-celled stone. Many species of the genus *Psychotria* Linnæus, too, assume appearance and manner of growth of certain *Plectroniæ*, but differ in the ovule being erect, anatropous, with the micropyle opening downward, and in the inferior radicle of the embryo; on this account *Psychotria* is placed in a different tribe of the Rubiaceæ.

Plectronia is one of the largest genera of its family, some 200 species having been described from the tropical and subtropical parts of the Old World. About 150 species are known from Africa and of these twenty-four have been recorded from the Belgian Congo. Though only three of the African species have so far been mentioned as associated with ants, I suspect, from my observations in the Congo, that many others will turn out to be myrmecophytes.

Plectronia connata De Wildeman and Durand

Plectronia connata É. DE WILDEMAN AND TH. DURAND, 1899, Bull. Soc. Bot. Belgique, XXXVIII, 2. p. 201; 1901, 'Reliquiæ Dewevreanæ,' p. 122. É. DE WILDEMAN, 1904, 'Études Flore Bas- et Moyen-Congo,' I, pt. 2, p. 204; 1912, ibid., III, pt. 3, p. 488. H. KOHL, 1909, Natur u. Offenbarung, LV, pp. 161–162.

"Tree or shrub. Branches more or less terete, glabrous, inerm. Leaves opposite; petiolate, the petiole 1 to 1.5 cm. long; ovate-elliptic; dark green and sparsely pilose especially on the veins on the upper side, on the under side brown and paler in dried condition, sparsely pilose especially on the veins; the blade more or less decurrent along the petiole; abruptly and short acuminate at the apex, the acumen about 5 mm. long; rounded at the base; 7.5 to 10 cm. long and 4 to 5 cm. broad; on each side with about 7 lateral veins, which anastomose in curves before the margin and are united with the smaller veins. Stipules soon deciduous. Inflorescences axillary, 3 to 4 cm. long and about 3.5 cm. broad, opposite, dichotomous, bracteate at the base of the dichotomies; the bracts more or less broadly connate at the base, ovate-acute, 3 to 4 mm. long. Flowers pedicellate, the pedicel about 3 mm. long. Calyx campanulate, 5-toothed, the teeth short. Corolla 5-lobed; the tube 2.5 mm. long and about the middle 1.5 mm. broad; the lobes reflexed, about 2 mm. long and 1 mm broad, ovate-acute. Stamens 5, not exserted; the filaments short. Style filiform, exserted over a long distance, about 1 cm. long, glabrous; the stigma capitate, short lobulate at the apex, about 0.5 mm. thick" (De Wildeman and Durand, 1899).

Belgian Congo: Lower Congo: Sele River (Butaye). Middle and Upper Congo: Bolengi (M. Laurent); Likimi (Malchair); Lomami River, type locality (Dewèvre).

This species is easily recognized by the united bracts which form a sheath at the base of the ramifications in the flower panicles. According to Marcel Laurent, the natives at Bolengi call this plant "Boka na pombo" which means "ant-village." It is possibly one of the myrmecophileus members of the genus, and has therefore been included here.

Plectronia glabriflora (Hiern)

Plectronia glabriflora (Hiern) K. Schumann, 1895, in Engler, 'Pflanzenwelt Ostafrikas,' C, p. 386. H. Krause, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–1908),' II, p. 326.

Canthium glabriflorum Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 140; 1898, 'Catalogue Afr. Plants Welwitsch,' II, p. 474. K. Schumann, 1891, Ber. Deutsch. Bot. Ges., IX, pp. 61–62. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 162.

Canthium polycarpum Schweinfurth Mss., 1877, *ex* Hiern, in Oliver, 'Flora of Tropical Africa,' III, p. 139.

"An unarmed tree, 40 to 50 feet high, with palm-like habitus; branches erect-patent, obtusely angular, glabrous or somewhat hispid. Leaves oval, shortly and abruptly acuminate, with a broad somewhat excavated base, thinly coriaceous, scabrous-hispid or glabrate above, turning reddish when dry, more or less hispid on the veins beneath, 3 to 5 by 1½ to 2½ in.; lateral veins about 7 to 8 pairs; petiole ⅕ to ⅖ in., hispid or glabrate; stipules ovate, ⅛ to ⅙ in. long. Flowers ⅙ in. long (exclusive of the style), on short puberulous or glabrate pedicels, many together, in dense dichotomous globose panicles of 1 to 1½ in. diameter; common peduncle glabrate or puberulous, short or ranging up to ½ in., spreading, sometimes unilateral. Calyx-tube glabrous; limb truncate or obscurely toothed, glabrous or ciliolate. Corolla glabrous outside, bearded inside; lobes 5, subobtuse. Disk glabrous. Stigma elongate-calyptriform, much exserted" (Hiern, 1877).

San Thomé: at 1000 feet (Mann; Welwitsch).

Southern Nigeria: Old Calabar (W. C. Thomson).

Cameroon: Barombi (Preuss).

Belgian Congo: Kwidjwi Island near Mgaturo in the forest (Mildbraed). Northeastern Region: Nabambisso River in the Niam-Niam Country (Schweinfurth).

Angola: Malange (Buchner).

Preuss, who observed this species in Cameroon, calls it an "ant-plant." According to Schumann (1891), the ants live inside the hollow stem and probably also in the horizontal branches. No other observations have been made on this form and its description is reproduced here chiefly on account of its possible identity with *P. Laurentii*.

Plectronia Laurentii De Wildeman

Plectronia Laurentii É. De Wildeman, 1906, 'Mission Émile Laurent,' III, pp. 294–296, Pls. xcviii–xcix; 1907, 'Études Flore Bas- et Moyen-Congo,' II, pt. 2, p. 174; 1908, ibid., II, pt. 3, p. 348; 1910, ibid., III, pt. 2, p. 294. Th. and H. Durand, 1909, 'Sylloge Flor. Congol.,' p. 268. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 160–161.

"Shrub reaching a height of about 2.25 m., with quadrangular stems showing opposite the leaves a groove pierced with openings which allow ants to enter the internodal cavity. Branches spreading, glabrous when full-grown. Leaves oppposite, petiolate; the petiole reaching a length of 2 to 3 cm., ciliate on the sides; the blade wedge-shaped, rounded or almost subcordate at the base, very broadly cuneate or acuminate at the apex, more or less coriaceous, 7 to 28 cm. long and 6 to 16 cm. broad, with 8 to 12 lateral veins on each side of the midrib. Leaf-blade with scattered hairs, appressed on the upper side, somewhat more abundant on the under side, especially on the veins, which are villose, seabrous, and ciliate on the margins. Stipules triangular, subapiculate, about 1 cm. long. Inflorescences axillary, opposite, reaching a length of 5 to 6 cm. and about equally broad. Common peduncle short, glabrous, 3 to 8 mm. long, with dichotomous ramifications which bear below each bifurcation a more or less regular ring of bracteoles. Flowers fasciculate at the end of the ramifications; the pedicel short, slender, accrescent on the fruit and sometimes reaching a length of 5 mm. Calyx with feebly widened limb, superficially denticulate, glabrous. Corolla about 2 mm. long, glabrous externally, with 5 lobes. Style unknown in adult condition. Fruit flattened, subreniform, 6 mm. high, 9 mm. broad, and 4 mm. thick, sometimes one-celled by abortion" (De Wildeman, 1906).

Belgian Congo: Middle and Upper Congo: Bokala; Irebu; Chumbiri; Bolengi; Eala (M. Laurent); Lukolela (Pynaert); Bolombo; Nouvelle-Anvers; Malema (É. and M. Laurent). Eastern Congo Forest: Romée (H. Kohl); Tshopo River near Stanleyville (March 6, 1915; J. Bequaert; Coll. No. 7042); between Walikale and Lubutu (village of Pale, January 12, 1915; J. Bequaert; Coll. No. 6585); Paku (Seret).

It would seem from the description that *Plectronia glabriflora* (Hiern) is rather closely allied to, if not identical with, *P. Laurentii*; it is hardly to be expected that a plant so commonly found throughout the Congo Basin is absent from Cameroon and Angola.

Ecology of *Plectronia Laurentii*

The following notes were made on specimens in the forest region between Walikale and Lubutu (near the village of Pale, January, 1915; Coll. No. 6585) and along the Tshopo River near Stanleyville (March, 1915; Coll. No. 7042). This plant is a bush or small tree, about 4 to 7 meters high, with an erect, straight trunk, bearing from a short distance above the ground regularly opposite, nearly horizontal branches. The most striking feature is the squareness of the limbs which, on the younger parts of the plant, show four very pronounced longitudinal grooves interrupted at the nodes only. Above the nodes, where the myrmecodomatia are located, the depressions expand into four broad, flat sides, the stem being almost regularly square on a cross-section. Older branches often become more cylindrical, only slight traces of the longitudinal furrows being left. The leaves are short petiolate, large and broad, as much as 28 cm. long and 16 cm. wide. The stipules drop off early. While the stalk and limbs are glabrous and smooth, the leaves are slightly hairy and somewhat rough.

Both the trunk and lateral branches of *P. Laurentii* were inhabited by ants, of the form *Crematogaster africana* subspecies *laurenti* (Forel) in the case of the specimens from the Tshopo River, and of the variety

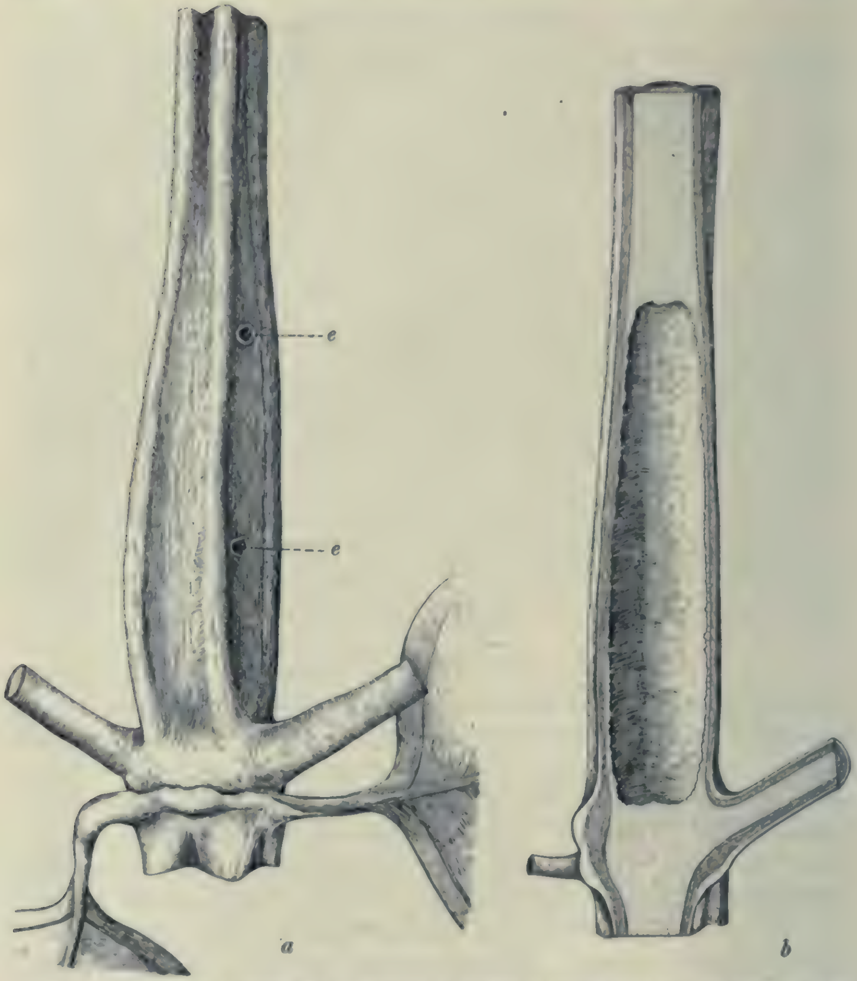


Fig. 95. *Plectronia Laurentii* De Wildeman: a, portion of branch with swelling above node inhabited by ants, showing apertures (*e*) to the domatium; *b*, longitudinal section of this myrmecodomatium. Drawn from life at Pale, between Walikale and Lubutu, January, 1915; natural size.

zeta (Forel) of that race in those found between Walikale and Lubutu. The older stalks of the plants are not much swollen, but the medullary cylinder is almost completely excavated, even the partitions at the nodes being occasionally perforated. In younger branches the various myrmecodomatia are more distinct; they are then moderately pronounced, quadrangular swellings, with the flat sides separated by slightly raised, obtuse ridges (Fig. 95*a* and *b*). They usually extend the basal two-thirds of each internode and very gradually disappear in the upper part toward the node. The internal cavity is quite spacious, 6 to 7 cm. long and 10 to 15 mm. wide. An examination of very young shoots shows that the swellings are normal productions of the plant and that the cavities originate through the drying of the pith before the ants gnaw apertures. Hollows inhabited by these insects present a number of small, circular exit holes, which in my specimens were commonly located on any one of the sides. According to Kohl (1909, p. 161), they are placed on the surfaces facing the lower leaf pair, but this is far from being the rule. Many swellings, especially on the younger branches, have only one aperture; more commonly there are 2 to 4 entrances to each cavity, and in some cases as many as 12 to 15.

At least on the younger portions of the plant, every domatium contains a complete ant colony, with a queen, workers, and brood. Frequently coccids also are present and those found by Kohl near Stanleyville, together with *Crematogaster*, in the swellings of *P. Laurentii* have been described by Newstead (1910, p. 18) as *Hemilecanium recurvatum*. A number of such scale insects were also fixed on the outer surface of the stem, especially near the nodes, within tents of plant-fibres built by the ants and often communicating with their cavities. Kohl (1909, p. 161) further mentions that some of the internodes of a *Plectronia* in that locality were occupied by small, white caterpillars, while others were inhabited by ants.

Plectronia Laurentii was discovered at various places along the banks of the Middle and Upper Congo by Ém. Laurent, who has given in his field-notes a good account of its relations with ants (De Wildeman, 1906, pp. 294–296). Much additional information on this species has been published by H. Kohl (1909, pp. 160-161). These observations agree in most details with mine.

The ants, all of the genus *Crematogaster*, found associated with *P. Laurentii* are evidently facultative inhabitants of these plants. The following forms have been recorded thus far:

Crematogaster africana (Mayr), variety. Belgian Congo; found by Ém. Laurent (Kohl, 1909, p. 161).

C. africana subspecies *laurenti* (Forel). Found by Laurent at Bokala (Kohl, 1909, p. 160), by Kohl at Isangi and Stanleyville (Forel, 1909, p. 60), and by myself near the Tshopo River.

C. africana subspecies *laurenti* variety *zeta* (Forel). Between Walikale and Lubutu (J. Bequaert) and in the Congo (Kohl; see Forel, 1909, p. 70).

C. africana subspecies *winkleri* (Forel). Belgian Congo (Kohl; see Forel, 1909, p. 69).

C. africana subspecies *winkleri* variety *fickendeyi* (Forel). With regard to this variety Forel (1916, pp. 409–410) writes:

> Kohl has collected various forms transitional between the race *winkleri* and the variety *fickendeyi*, on one occasion in a nest, probably usurped, of *Tetramorium aculeatum*, also in myrmecophilous plants or in termitaria. His No. 68 bears the following interesting remark: "Ant from plants. Lives in and on the myrmecophyte *Plectronia Laurentii* De Wildeman. Five meters above the ground the trunk bore a carton nest, 40 to 50 cm. high, of this ant. But it inhabits at the same time all the hollow branches of the plant. Makanga on the Okiavo River." One may conclude from this that there is no absolute contrast between the carton nest of *buchneri* and the habit of living in hollow stalks.

Ecology of Unidentified African Species of *Plectronia*

In addition to the species just studied, I have found caulinary swellings inhabited by ants on a number of rubiaceous plants which are provisionally regarded as belonging to the genus *Plectronia*. It is possible, however, that one or more may be species of related genera, such as *Vangueria*, *Grumilea*, or *Psychotria*. At any rate, I have been unable to identify them with any of the described African Rubiaceæ and they may even represent forms new to science. Their correct identification will undoubtedly be made later when the study of my herbarium, now in the hands of Mr. De Wildeman, Director ot the Brussels Botanic Garden, is more advanced.

Plectronia species A.—This species was first observed on the forested banks of the Aruwimi River near the village of Bafwalipa, between Bomili and Avakubi (December 29, 1913; Coll. No. 1696). It also occurred in the Ituri Forest, near the village of Tete, between Penge and Irumu (February 22, 1914; Coll. No. 2567), and, in company with Mr. Lang, I came across it again along the Tshopo River near Stanleyville (March 6, 1915; Coll. No. 7043). It is a climbing, much-branched bush of the forest, with simple, opposite, short petiolate or subsessile leaves, which are asymmetric and cordate at the base. There were no thorns or spines on the specimens I examined. The entire plant—leaves and stems—is abundantly covered with long, erect, brownish hairs. The flowers are small and clustered in corymbs in the axils of the leaves.

Myrmecodomatia (Fig. 96) are found on some of the branches only. They consist of spindle-shaped swellings on the lower third of an internode, are about 30 mm. long and 8 mm. thick, and placed immediately above the node. The domatium is a spacious, rather thin-walled cavity. When inhabited, it is almost wholly cleaned of medullary tissue and communicates with the outside by means of a broad, irregular aperture, placed about the middle of the swelling. It was noticeable that leaves at the base of the expanded area are shorter and more heart-shaped than elsewhere on the plant. In this case, too, the enlargements are normal productions and their inner cavity originates through the drying of the pith and without the agency of ants.

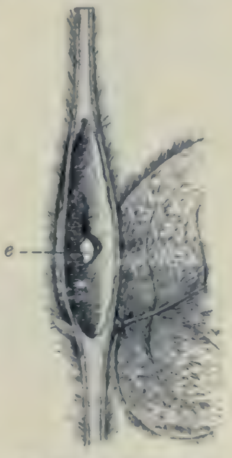


Fig. 96. *Plectronia* species A. Portion of branch in longitudinal section, showing a domatium occupied by ants: *e*, aperture leading into the cavity. Drawn from life at Bafwalipa, between Bomili and Avakubi, December, 1913; natural size.

Mr. Lang collected specimens of *Cataulacus trægaordhi* variety *plectroniæ* Wheeler in domatia of this species along the Tshopo River, while I found a few workers of *Engramma kohli* Forel in other swellings of the same plant.

Plectronia species B.—I obtained this *Plectronia* in the Rain Forest near Avakubi (January 10, 1914; Coll. No. 1871) and Penge (February 14, 1914; Coll. No. 2478), in both cases on the banks of the Ituri River. It is a creeper whose main stem, about 20 mm. thick near the ground, hangs freely in true liana-fashion between the bushes, while the branched upper part spreads its leaves over the crowns of low trees and undergrowth. Evidently closely related to the preceding form (species A), it differs chiefly in being more sparsely hairy, and in having myrmecodomatia of another shape. Furthermore, the main stalk bears at the nodes strong thorns placed in pairs and formed by the hardened bases of aborted branches.

In this species ants inhabit the thickened main stem, as well as the branches. On the latter the myrmecodomatia (Fig. 97a) are elongate, spindle-shaped swellings of the nodal region, extending about as far below as above the node. They are almost completely excavated and rather thin-walled; their internal cavity is 9 to 11 cm. long, 8 to 10 mm. wide, and even extends a short distance into the slightly swollen bases of the opposite branches. In this case too the expansions are normally present on the plant and their medullary tissue soon dries up, the ants merely piercing the orifices and removing the remains of pith. When occupied by these insects, the domatia usually have a number of apertures, placed above the node in an irregular, longitudinal row; there is often an exit hole also at the enlarged base of the side twigs. Even the nodes of the main stalk (Fig. 96*b*) are tenanted but, owing to the thickening of

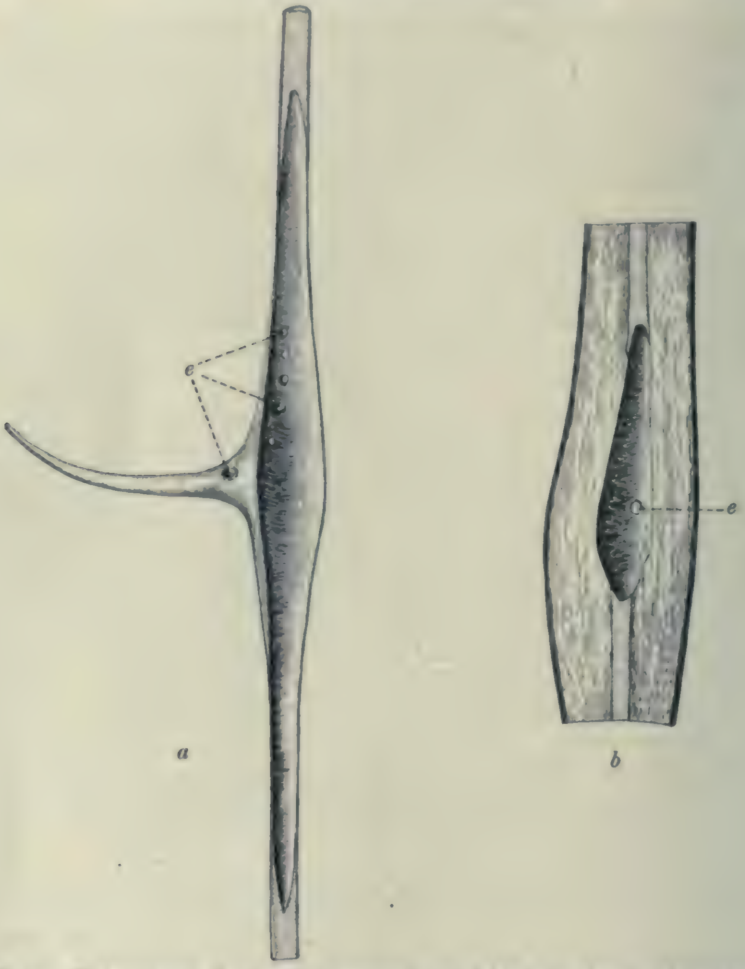


Fig. 97. *Plectronia* species B; a, portion of younger branch in longitudinal section, showing myrmecodomatium at the node which also extends into the base of the lateral ramification; *b*, portion of main stalk, showing shape of domatium in older parts of plant; *e*, apertures leading into the cavity. Drawn from life at Avakubi, January, 1914; natural size.

the woody cylinder, are but slightly or not at all swollen and their inner cavity is much reduced (3 to 4 cm. long, 5 to 7 mm. wide); they usually present two openings placed on a crateriform elevation, one above each of the nodal thorns. Frequently there are scars of other perforations which have been closed by callus growth.

The ants found inside this *Plectronia* belonged in both localities to a small, unidentified species of *Crematogaster* which can hardly give protection to its host. Even though most of the domatia were inhabited, the leaves had been eaten by caterpillars and both young branches and leaves bore numerous insect galls—elongate, pear-shaped swellings ending in a recurved tail-like apex and on one side of the tail with a small exit hole leading into a central chamber; their outer surface covered with many erect, brownish-red hairs; all the galls seen were empty.

Plectronia species C.—In the Semliki Forest, near Lesse (June 15, 1914; Coll. No. 4753), I came across a creeper whose many hanging branches had covered the bushes at the edge of a clearing. It is perhaps specifically identical with the preceding form (species B), possessing most of its general charaters. Yet the domatia are sufficiently different in shape to deserve separate description.

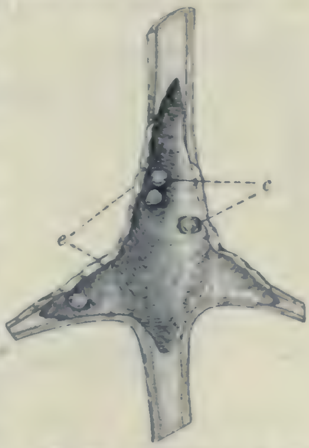


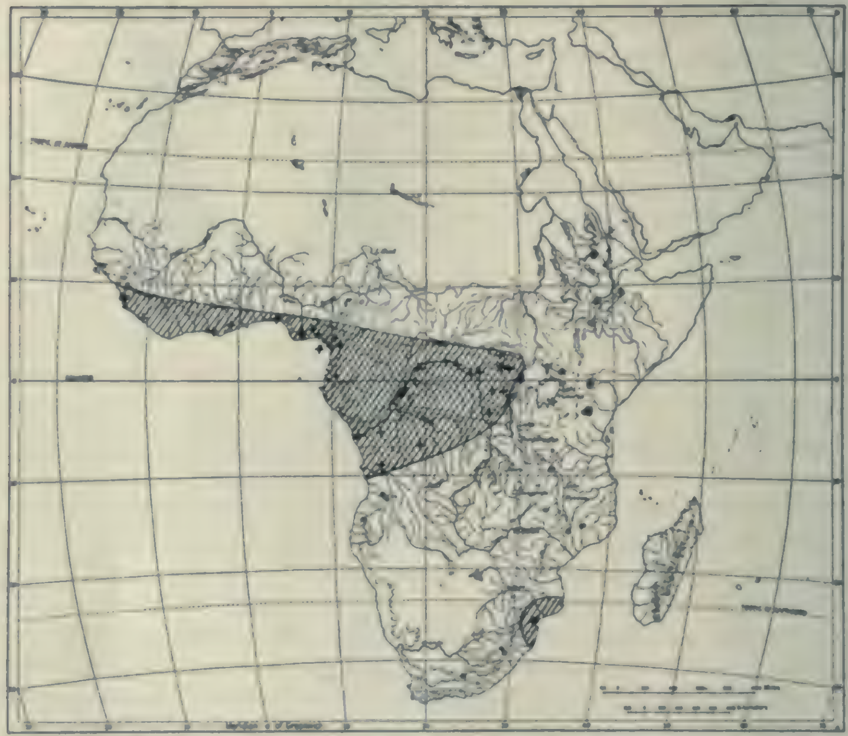
Fig. 98. *Plectronia* species C. Longitudinal section of swollen node inhabited by ants: *e*, callus growth bordering the slit which leads into the cavity; *c*, coccids attached to inner walls. Drawn from life at Lesse, June 1914; natural size.

The ant-swellings (Fig. 98) are short and broadly spindle-shaped, and occupy the lower part of the internodes of most of the branches. The inner cavity is very spacious, 6 to 8 cm. long and 15 to 20 mm. wide, continues a little below the node, and extends also into the slightly swollen bases of the side branches. A peculiarity of this *Plectronia* is that the domatia lack circular apertures, but communicate with the outside by means of two long slits, placed opposite each other in the upper part of the swelling, above each of the side branches. Often these openings are partly closed by callus growth. The plant at Lesse was inhabited by populous colonies of a small *Crematogaster* with a queen, numerous workers, and brood at various stages; also coccids which were fixed on the callus tissue near the inner margin of the slits.

Cuviera de Candolle

Cuviera A. de Candolle, 1807, Ann. Mus. Paris, IX, p. 222; 1830, 'Prodromus Regn. Veget.,' IV, p. 468. Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 156. K. Schumann, 1891, in Engler and Prantl. 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 94.

Glabrous shrubs or small trees, rarely with puberulent young branches. Leaves usually large, broadly ovate, entire, opposite, coriaceous or leathery; stipules apiculate, united into a short sheeth between the bases of the petioles. Flowers polygamous, with large foliaceous bracteoles, in many-flowered, axillary panicles. Sepals 3 to 5, almost free or shortly united at the base, foliaceous, spreading, often unequal, persistent, much longer than the petals. Corolla hypocrateriform, with a short, straight tube furnished inside with a ring of deflexed hairs, and large, fleshy lobes. Stamens 5, exserted, placed on the mouth of the corollar tube. Ovary 3- or 5-celled, each cell with one ovule. Ovule suspended, with upper micropyle and flattened funiculus. Style with a semiglobose, cap-shaped or mushroom-shaped, sulcate stigma. Fruit an obovate drupe, often oblique or falcate, distinctly ribbed, with 3 to 5 seeds.



Map 46. Distribution of *Cuviera*, a genus of myrmecophytic plants.

Cuviera is a strictly African genus, of which fourteen species have been described. Its general distribution is shown on Map 46. The genotype, *C. acutiflora* de Candolle, is found in Upper Guinea. Only one form, *C. australis* K. Schumann, has been described from South Africa. All the others occur within the limits of Engler's Western Forest Province, either in the Rain Forest proper or on the forested river banks of the adjoining Savannah, below 3000 feet. With the possible exception of *C. australis*, all the members of the genus may be myrmecophytes and their descriptions have, therefore, been reproduced here. Some of these so-called species are perhaps mere synonyms.

Cuviera acutiflora de Candolle

Cuviera acutiflora A. DE CANDOLLE, 1807, Ann. Mus. Paris, IX, p. 222; 1830, 'Prodromus Regn. Veget.,' IV, p. 468. BENTHAM AND HOOKER, 1849, 'Niger Flora,' p. 407. HIERN, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 156.
Cuviera africana SPRENGEL, 1825, 'Syst. Veget.,' I, p. 760.

"A glabrous shrub, 15 to 20 ft. high. Branches terete, divaricate, supra-axillary. Leaves oval-oblong, acuminate, subequal and rounded or somewhat narrowed at the base, coriaceous, glossy, rather or scarcely paler beneath, 4 to 10 by $1\frac{3}{4}$ to 4 in.; some 4 to 6 in. wide (Bentham); lateral veins about 6 to 10 pairs, not conspicuous; petiole $\frac{1}{8}$ to $\frac{1}{4}$ in.; stipules ovate, apiculate, $\frac{1}{3}$ in. long, connate and sheathing below, keeled, hairy within. Flowers greenish, $\frac{3}{8}$ to $\frac{2}{5}$ in. long in bud, on short, slender pedicels, very numerous, in ample, divaricately branched, rather lax, axillary and terminal, shortly pedunculate, dichotomous panicles of 2 to 6 in. diameter; bracteoles elliptic-linear, $\frac{3}{8}$ to 1 in. long, accrescent. Calyx green; segments $\frac{3}{8}$ to $\frac{1}{2}$ in. long, linear-oblong, spreading, persistent. Corolla green and orange; segments lanceolate, caudate-acute, $\frac{3}{8}$ in. long, spreading. Ovary 5-celled; style glabrous. Fruit obliquely egg-shaped, $\frac{3}{4}$ to $\frac{5}{6}$ in. long, obtusely 5-sided; pyrenes 5 or fewer" (Hiern, 1877).

Sierra Leone, type locality (Smeathman).
Ivory Coast: Grand Bassam (Th. Vogel).
Cameroon: Ambas Bay (Mann).

Cuviera angolensis Hiern

Cuviera angolensis HIERN, 1898, 'Catalogue Afr. Plants Welwitsch,' II, p. 483. É. DE WILDEMAN AND TH. DURAND, 1901, Bull. Herbier Boissier, (2) I, p. 826; 1901, 'Reliquiæ Dewevreanæ,' p. 124. É. DE WILDEMAN, 1904, 'Études Flore Bas- et Moyen-Congo,' I, p. 205; 1907, ibid., II, pp. 78 and 173; 1908, ibid., II, 3, p. 348; 1910, ibid., III, 2, p. 295; 1912, ibid., III, 3, p. 489; 1906, 'Mission Émile Laurent,' III, pp. 296–299, Pl. CVI. H. KOHL, 1909, Natur u. Offenbarung, LV, pp. 163–166. TH. AND H. DURAND, 1909, 'Sylloge Flor. Congol.' p. 271. (K. Schumann, in Engler and Prantl, 1891, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 94, fig. 33*J*, without description; also mentioned without description by K. Schumann, 1890, Verh. Bot. Ver. Brandenburg, XXXI, 2, p. 121, and 1891, Ber. Deutsch. Bot. Ges., IX, p. 56).

"A small glabrous pyramidal tree, 12 to 20 ft. high, or in cultivated fields (*arimos*) usually only 8 to 12 ft. Sap milky. Trunk slender, straight, destitute of branches below, but densely armed with opposite, decussate, strong, very acute, quite patent spines of 1 to 2 in. in length. Branches and branchlets green, the latter swelled at the nodes. Leaves long, opposite, usually cuspidate at the apex, oblique and rounded at the base, papery, smooth, 4 to 9 in. long by $1\frac{1}{2}$ to 4 in. broad, dull-green above, paler beneath, those on the older branches pendulous; petiole $\frac{1}{8}$ to $\frac{1}{3}$ in. long; lateral veins about 8 on each side of the midrib, rather slender and beneath conspicuous. Stipules sheathing, keeled, acuminate, about $\frac{3}{8}$ to $\frac{1}{2}$ in. long. Inflorescence axillary, branched, 2 to 4 in. long, pale yellow-greenish outside throughout except a bright rosy stellate patch about the naked throat of the corolla; pedicels very short;

common peduncle ¼ to 1 in. long; bracteoles sub-linear, ranging up to 1 in. in length. Calyx including and adnate to the ovary; tube short, campanulate-ventricose, obtusely 3- to 4-angular, deeply 3- to 5-lobed; the segments elongate-lanceolate, unequal in length, bract-like, exceeding the corolla, herbaceous-green, ½ to 2 or 3 in. long. Corolla shortly salver-shaped, fleshy-coriaceous, deep herbaceous-green outside; tube short, bright-red inside, at the base inside with a ring of shiny silvery hairs directed downward; limb 5-cleft, shortly rotate; segments lanceolate or ovate-acuminate, rigid, green, expanded in a stellate manner in full flower, valvate at the base in estivation; the tips long, acuminate or subulate, contorted in the bud. Stamens 5, inserted in the sinuses of the corolla-lobes around the ring of hairs; rigid, exserted; filaments compressed-cylindrical, fleshy, curved-patent at the time of flowering; anthers ovate, cordate, introrse, 2-celled, obtuse at the apex, basifixed; cells separate at the base, cohering at the apex longitudinally, yellow. Ovary adnate to the calyx-tube, 5-celled; cells 1-ovuled; disk a little elevated, flat; style thick, columnar, rosy, densely pilose; stigma mitriform, large, obtuse, stigmatose and cleft at the apex. Fruit oblique, deeply furrowed, about 1 in. long, crowned with the more or less persistent calyx-limb or with its remains" (Hiern, 1898).

Angola: Golungo Alto: "among the mountainous forests of Alto Queta," type locality (Welwitsch).

Belgian Congo: Kisantu (Gillet). Kwango: Kikwit (Lescrauwaet). Middle and Upper Congo: Lukolela (Dewèvre); Likimi (Malchair); on the left bank of the Congo below Bolombo; Malema; Lie (Ém. Laurent); Irebu (Pynaert); Eala (M. Laurent). Northeastern Congo forest: Isangi; Tshopo River near Stanleyville (Ém. Laurent); Romée (H. Kohl); Nala; Lifungula (Seret); Manyema (Berger).

Cuviera australis K. Schumann

Cuviera australis K. Schumann, 1899, Engler's Bot. Jahrb., XXVIII, 1, p. 78.

"Shrubby, with rigid, divaricate, terete, glabrous branches; the young branches flattened and puberulent. Leaves with short petioles, oblong, ovate, or oblong-lanceolate, obtuse, rounded or acute at the base, glabrous above; on the under side softly puberulent on the primary veins, otherwise glabrescent; discolored, herbaceous. Stipules subulate or filiform from a broad base, not setose inside. Cyme twice, more rarely three times trichotomous, axillary, appearing below the leaves, pedunculate, minutely puberulent, with very slender branches. Flowers pentamerous, pedicellate. Ovary sub-semiglobose, slightly hairy, 5-celled. Calyx divided to near the base into foliaceous, subspatulate, elongate lobes. Corolla divided beyond its middle into five lobes, which are lengthened subtriangular and hirsute externally; tube glabrous on the outer side. Style exserted for twice the length of the tube, with 5-toothed stigma.

"The flowering branch at hand is 30 cm. long and 2 to 2.5 mm. thick at the base where it is covered with gray bark. The petiole is 3 to 6 cm. long and very finely pilose; the blade is 3 to 5 cm. long, 1.1 to 2.7 cm. broad in the middle, traversed on each side of the midrib by 5 or 6 stronger veins which are slightly prominent on both sides, black above, gray below. The stipules are 2 to 3 mm. long. The flowers are borne on finely pilose pedicels, 5 to 9 mm. long. The ovary is 2 mm. long, the calyx 7 to 8 mm.; its lobes are very obtuse and reach a width of 2 mm. above. The corolla-tube is 3 to 4 mm. long; its lobes are 6 to 7 mm. long and are very finely pilose outside. The anthers are a little over 1 mm. long and inserted on a filament of 0.5 mm. The style is exserted for 6 to 7 mm. out of the corollar tube.

"Different from all the other species, which occur in tropical West Africa only, by the much smaller flowers and leaves. I believe I should have distinguished two forms, one of the specimens is more hairy and has much smaller flowers. Schlechter thinks, however, that both specimens come from one and the same bush" (K. Schumann, 1899).

Portuguese East Africa: Delagoa Bay, at 30 m. (Schlechter).

Cuviera calycosa Wernham

Cuviera calycosa WERNHAM, 1914, Journ. of Botany, London, LII, p. 7.

"Tree 90 feet high, glabrous, nigrescent in dried condition, with terete branches later on covered with grayish bark. Leaves parchment-like, elliptic or oblong, small for the genus, shortly and narrowly acuminate, obtuse, acute at the base, glabrous; petiole very short. Stipules small, lanceolate, acuminate, caducous except for the broad base. Inflorescences having few flowers, dichotomous, rather loose; bracts oblong-lanceolate, obtuse. Calyx large, much exceeding the corolla; with uneven, ovate-lanceolate, acuminate and very acute lobes. Corolla with a broadly funnel-shaped to cylindric, rather short tube; its 5 lobes acuminate with long appendages and a few scattered, rather long hairs. Drupe very glabrous, crowned by the persistent limb of the calyx.

"A remarkable species, the nearest affinity being clearly *C. nigrescens* (Scott-Elliot); the present species is distinct, especially in the very large calyx and small corolla. The leaves measure 10 to 11 cm. × 4 to 4.5 cm., with petiole about 1 cm. long; secondary veins 5 to 6 pairs; stipules 6 to 8 cm. long. Peduncle 3 cm.; cyme 11 to 12 cm. wide, 5 to 6 cm. long. Pedicel 5 mm.; calyx-tube minute, lobes 3 to 3.5 cm. × 4 to 7 mm. Corolla-tube barely 5 mm. long, and nearly as much in average breadth; lobes, flat part 4 to 5 mm., setæ over twice that length. Berry 1.4 cm. × 1.1 cm." (Wernham, 1914).

"Youngest flowers white, older ones cream, oldest thin orange. Centre of flower greenish. Calyx-lobes bright green, with margin and setæ white. Setæ of corolla-lobes white; anthers dark-purplish brown; style white, stigma pale green" (Mrs. Talbot).

Southern Nigeria: near Esuk Ekkpo Abassi in the Eket District (Mr. and Mrs. P. A. Talbot).

Cuviera latior Wernham

Cuviera latior WERNHAM, 1918, Journ. of Botany, London, LVI, p. 311.

"A very glabrous shrub, with very smooth, subterete, moderately robust, striate branches, swollen and excavated at the nodes (apparently with a myrmecodomatium). Leaves large, parchment-like, broad, oblong, but little acuminate, cordate and very unevenly oblique at the base; petiole short, though distinct; primary veins conspicuous, 10 to 12 on each side. Stipules connate into a broad sheath, which is very short, arcuate above, and obscurely spiculate between the petioles. Flowers large for the genus, placed in loose, few-flowered, forked cymes; common peduncle much flattened; pedicels very short. Calyx with 3 lobes which are full of veins, broadly lanceolate, long acuminate, large and leaf-like. Tube of the corolla broad and very short, its 5 lobes oblong, very acuminate, subsetaceous and cucullate at the apex. Ovary deeply sulcate; style thick, densely and finely hispid.

"Notable for the broad calyx-lobes and the large flowers. Leaves 20 to 26 cm. × 8 to 9 cm., with petiole 6 to 8 mm. at longest; stipule-sheath 2.5 mm. deep. Peduncle 2 cm. long, forking at the tip into two floriferous branches about 10 cm. long. Calyx-lobes 3 to 3.5 cm. long, and 1 cm. or more broad. Corolla-tube barely 4 mm long; lobes 1.6 cm. × 4 mm. Anthers 2 mm. long. Style 1 cm. long" (Wernham, 1918).

Belgian Congo: north of Boyeka (Nannan).

Cuviera Ledermannii Krause

Cuviera Ledermannii Krause, 1912, Engler's Bot. Jahrb., XLVIII, p. 418.

"Erect shrub or small tree, with slender, strong, glabrous branches and branchlets, which are swollen, a little flattened and hollow at the nodes; bark smooth, dark brown or almost black in spots. Leaves large, short-petiolate; stipules broadly ovate, minutely acuminate at the apex, soon dropping, connate at their base into a short sheath which persists longer; petiole short, strong, grooved above to near its base; blade thick, coriaceous, very glabrous on both sides, oblong or elliptic-oblong, rather long acuminate at the apex, obtuse at the base or even shortly decurrent along the petiole; primary veins 9 to 12, slightly prominent above, more distinctly so below, running in an obtuse angle from the costa. Inflorescence axillary, short, with few flowers; bracts large, narrowly oblong, obtuse. Ovary semiglobose; lobes of the calyx large, narrowly oblong, acute, 2 to 3 times longer than the ovary; tube of the corolla cylindrical, scarcely broadened above, the lobes lanceolate-oblong, acute, as long as or longer than the tube; stamens with very short filaments, the anthers small, oval-oblong; style rather highly exserted above the tube of the corolla, crowned with a rather large, mitriform stigma.

"The plant is a shrub or small tree; the branches which I have before me are covered with dark brown or almost black bark; they are 2 to 3 dm. long and 5 mm. thick at their base; the thickened, hollow swellings, above the nodes, are 7 to 9 mm. in diameter; they undoubtedly are inhabited by ants. The stipules are 8 to 10 mm. long, the petioles 1.2 to 1.6 cm. The blades in a dried state are brownish-green to gray-green and, including their apex of 1.2 to 1.6 cm., are 1.8 to 2.5 dm. long, 7 to 11 cm. broad. The inflorescences attain a length of 7 cm. The large bracts, which may reach a length of 1.8 cm., in drying take on a leather-brown color, as do also the sepals. The ovary has a diameter of 2.5 mm. The sepals are 7 to 8 mm. long. The corolla, white in life, turns dark brown in drying; its tube is 4 to 5 mm. long, its lobes 5 to 6 mm. The filaments are about 0.8 mm. long, the anthers 1.2 mm. The style, including a stigma of about 1.5 mm., measures 8 mm." (Krause, 1912).

Cameroon: near Nkolebunde on the Nanga-slopes in a rather sparsely wooded place, at about 200 m.; also near Malende in the vicinity of Nkolebunde in dense, high forest with little underwood, at 150 m. (Ledermann; in flower during October).

The species agrees in most respects with *C. physinodes* K. Schumann, from which it is said to differ in "the branches, which are less strongly flattened and broadened at the nodes, and also in the darker, partly almost black bark."

Cuviera leniochlamys K. Schumann

Cuviera leniochlamys K. Schumann, 1899, Engler's Bot. Jahrb., XXVIII, 1, p. 79.

"Shrub with slender, terete flowering branches, the flattened younger ones also glabrous. Leaves with a short petiole, oblong, shortly and very sharply acuminate, acute at the base, herbaceous, glabrous on both sides. Stipules glabrous, subulate from an oval base. Flowers fasciculate in small numbers in the axils of the leaves, shortly pedunculate. Ovary subglobose, glabrous. Calyx very large, divided to beyond the middle into 5 acute lobes, membranaceous. Corolla twice as long as the calyx, divided beyond its upper third into apiculate, narrowly lanceolate lobes, with a hairy ring above its base. Anthers comparatively small. Style pilose at the thickened base; stigma cap-shaped, 5-toothed.

"A bush 4 to 5 m. high, whose flowering branches of 12 to 15 cm. are scarcely 2 mm. thick at the base, and are covered with a gray to blackish epiderm. The petiole is 2 to 6 cm. long and slightly canaliculate above; the blade is 9.5 to 17 cm. long and 4 to 7 cm. broad, green when dry, traversed on each side of the midrib by 6 stronger veins, which are a little more prominent below. The stipules are hardly 5 mm. long. The ovary, black when dry, is 1.5 to 2 mm. long and up to 3 mm. thick. The white calyx is 13 to 15 mm. long and membranaceous. The ochre-yellow corolla is 3 cm. long, of which 2 cm. is the tube; a ring of white hairs hangs down, 3 to 4 mm. above the base inside. The stamens are included and scarcely 3 mm. long. The style is white-hairy at the base and 2 to 2.1 cm. long, with a stigma 3 mm. high.

"The species can not be confused on account of its large, cupuliform, white colored calyx and the style which is hairy at the base" (K. Schumann, 1899).

Cameroon: Bipindi (Zenker).

Cuviera longiflora Hiern

Cuviera longiflora Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 157. K. Schumann, 1891, Ber. Deutsch. Bot. Ges., IX, p. 56; 1891, in Engler und Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 12, fig. 5. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 166.

"A glossy shrub of 25 feet or a small tree of 20 to 25 feet, glabrous or nearly so. Branches subterete, smooth. Leaves oval-oblong, cuspidate, oblique and hollowed at the base, spreading, thinly coriaceous, paler beneath, 6 to 12 by 2 to 4 in.; lateral veins about 10 to 12 pairs, inconspicuous; petiole ⅓ to ⅜ in.; stipules deltoid, keeled at the apex, hairy inside, ¼ in. long. Flowers 1¾ in. in diameter when expanded, on short pedicels, several together, in axillary panicles of 2 to 3 in. diameter; bracteoles narrowly elliptical, ⅔ to 1½ in. long; peduncle about 1 in. Calyx-segments lanceolate, ½ to ¾ in. long. Corolla-segments ¾ in. long, lanceolate, acute. Anthers drooping. Ovary 5-celled; style pilose-hirsute below; stigma cernuous" (Hiern, 1877).

Cameroon: Mt. Cameroon, at 2000 to 3000 ft., type locality (Mann). Also found in Cameroon by Preuss.

The presence of myrmecodomatia is not mentioned in the original diagnosis of this species, but Schumann found conical swellings on the basal part of the internodes of specimens collected by Preuss in Cameroon. Two longitudinal rows of three or four superposed orifices, often surrounded by a thickened ring, led into a cavity containing small, black ants of the genus *Crematogaster*.

C. longiflora is so closely related to *C. angolensis* that the differences are not clear from the descriptions. Some of the plants which I observed in the Belgian Congo agreed equally well with the descriptions of each and it seems possible that future investigation will result in the synonymizing of *C. angolensis* with the earlier described *C. longiflora*. H. Kohl (1909, p. 166) states that *C. longiflora* differs specifically from *C. physinodes* and *C. angolensis* "in the sparse, short pilosity of the style, which is very strikingly narrowed toward the apex." The style of *C. physinodes* is described as glabrous, which is also the case with *C. acutiflora* and *C. subuliflora*. *C. angolensis*, however, agrees with *C. longiflora* in having the style pilose, as was mentioned in the original description and as I have observed in my Congo specimens.

Cuviera macroura K. Schumann

Cuviera macroura K. Schumann, 1903, Engler's Bot. Jahrb., XXXIII, p. 352.

"Branches slender, not fistulose nor swollen, cylindrical, even the young ones flattened and glabrous. Leaves short petiolate, lanceolate or suboblong-lanceolate, subacuminate, acute at the base, margined, glabrous on both sides, somehow folded by drying. Stipules tubulose-connate, bidentate, accrescent, finally pierced by the inflorescences and withering away, villose inside. Flower panicle tripartite from the base, with many or dense flowers, glabrous. Bracts linear, acuminate. Ovary 5-celled. Sepals linear, acuminate, glabrous, united at the base into a cupule. Lobes of the corolla with very long appendages. Style hirsute.

"The flowering branches are 30 cm. long and only 3 mm. thick at the base; they are covered with brownish-black bark. The petiole is 3 to 5 mm. long and flattened above; the blade has a length of 9 to 15 cm. and in the middle is 2.5 to 4 cm. wide; it is crossed on each side of the midrib by 6 to 7 stronger veins which are prominent on both surfaces, but almost more so on the upper side; in dried condition it is black green above, leather-yellow below. The stipules are 7 mm. long. The 3 bracteoles are about 1.5 cm. long. The calyx has a total length of 1.6 cm., of which 1.3 cm. is to be allowed for the lobes. The corolla is 2 cm. long, half of this belonging to the appendages of the lobes. The stamens and anthers measure 1.5 mm.

"The species strikingly differs from all the West African ones in its small leaves and the long appendages of the corollar lobes" (K. Schumann, 1903).

Southern Nigeria: **Lagos** (Millen).

Cuviera minor Wright

Cuviera minor C. H. Wright, 1906, Bull. Misc. Inform. Bot. Gard. Kew, p. 105.

"Differs from the other species in its smaller, membranous leaves.

"A small tree. Branches ash-colored. Leaves ovate or oblong-ovate, acuminate, slightly uneven-sided, rounded or short cuneate at the base, glabrous; with about 6 lateral veins on each side of the midrib; 11.5 cm. long, 4.5 cm. broad. Petiole grooved above, slender. Stipules broadly triangular, dropping. Inflorescences axillary, with many flowers, 4 cm. long. Bracts oblong, narrowed at the base and at the apex, 8 mm. long. Lobes of the calyx 5, subfoliaceous, lanceolate, 8 mm. long. Tube of the corolla 4 mm. long, inside near the base with a ring of hairs bent downward. Lobes of the corolla triangular, acuminate-caudate, 1 cm. long, pilose externally, yellowish. Stamens 5, inserted between the lobes of the corolla; anthers sagittate, twice as long as the filaments. Ovary 5-celled, each with one ovule. Style 8 mm. long; stigma flask-shaped" (C. H. Wright, 1906).

Gold Coast: Kimaha (Johnson).

Cuviera nigrescens (Scott-Elliot)

Cuviera nigrescens (Scott-Elliot) WERNHAM, 1911, Journ. of Botany, London, XLIX, p. 321.

Vangueria nigrescens SCOTT-ELLIOT, 1894, Journ. Linn. Soc. London, Botany, XXX, No. 206, p. 81. OLIVER, 1894, in Hooker's 'Icones Plantarum,' XXIII, pt. 4, Pl. MMCCLXXXIII.

Cuviera trichostephana K. SCHUMANN, 1897, Engler's Bot. Jahrb., XXIII, 4, p. 461.

"A shrub with terete, grayish, glaucous branches, in youth black and covered with lenticels. Leaves becoming black by drying, very glabrous (except in the axils of the veins where they are hirsute), oblong-ovate or obovate, obtusely acuminate, subcuspidate, with coriaceous margin, narrowed at the base; 5 to 8 cm. long and 2 to 3 cm. broad; 5 or 6 pairs of lateral veins; petiole 6 to 8 mm. long. Stipules hirsute inside, rounded at the base, elongate-acuminate along the back, 3 to 5 mm. long. Peduncles faintly pilose, 5- to 10-flowered, 8 mm. long. Pedicels about 6 mm. long. Bracts ovate, obtuse, with reticulate venation, 8 to 9 mm. long and 4 mm. broad. Calyx with 5 large lobes, which are lanceolate, subacute, 8 to 9 mm. long and 2 mm. broad. Lobes of the corolla caudate-acuminate, 15 to 17 mm. long (the acumen 3 to 4 mm.), sparsely hirsute on the outside with white hairs 1 mm. long, internally with a ring of reflexed pile. Filaments 2 mm., anthers 1 to 2 mm. long. Stigma cylindric, large, 1 to 2 mm. long and 1 mm. broad. Ovary 5-celled" (Scott-Elliot, 1894).

Sierra Leone: in the forest between 1000 and 3600 feet; near Kafogo in Limba and near Falaba (C. F. Scott-Elliot).

Liberia: Golah Forest (Bunting).

The Liberia specimens differ from those of Sierra Leone only in the length of the caudæ of the corolla-lobes, which in the former appear to be longer and more setaceous in character (Wernham).

Both Scott-Elliot and Oliver compare this species with the two other *Vangueriæ* with caudate corolla-lobes: *V. velutina* Hiern, which has densely tomentose leaves and inflorescences; and *V. pauciflora* Schweinfurth, with solitary or geminate flowers and truncate calyx.

This species was evidently redescribed by K. Schumann, in 1897, as *Cuviera trichostephana*, on part of the material collected in Sierra Leone by Scott-Elliot. For the sake of completeness, Schumann's description of *C. trichostephana* is translated here:

A woody plant with slender, terete or subtetragonal branches, very glabrous even in youth. Leaves on the specimen examined not completely developed, petiolate, oblong, shortly and obtusely acuminate, acute at the base and often suboblique, glabrous on both sides, but the axils of the veins with minute hairy domatia; stipules lineate-subulate, with triangular base. Axillary cyme with few flowers, glabrous; ovary 5-celled, glabrous; calyx with foliaceous or membranaceous, oblong, sharp lobes. Corolla divided to beyond its middle, with a corona of decumbent hairs inside, pilose at the outer side, with very long, caudate, linear-lanceolate lobes.

The branch at hand is 15 cm. long and at most 2 mm. thick at the base. The petiole reaches a length of 1 cm. and is slightly excavated above. The blade is 4 to 9 cm. long and 2 to 4 cm. broad in the middle; traversed by 5 stronger veins on each side of the midrib; black when dried; herbaceous in the specimen studied, but the leaves are apparently not yet fully developed. The stipules reach a length of 7 to 8 mm. The entire inflorescence is about 3 cm. long. The pedicels of the flowers reach a length of 5 mm. The ovary is semiglobose and 1.5 mm. long. The lobes of the calyx reach 10 mm. in length and 3 mm. in width. The corolla is 2.2 to 2.5 cm. long, of which the tube takes 9 to 10 mm. only. The anthers are 2 mm. long, placed on filaments 3 to 4 mm. long, exserted from the tube and curved. The style is 1.7 cm. long.

This species is easily separated from all others by the corolla covered with hairs, the smaller leaves, and the short inflorescences. It has more the appearance of the genus *Vanqueria*, so that it makes the generic limits less distinct.

Sierra Leone (C. F. Scott-Elliot).

Cuviera physinodes K. Schumann

Cuviera physinodes K. Schumann, 1891, Pringsheim's Jahrb. Wiss. Bot., XIX, pp. 55-56; 1891, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' IV, pt. 4, p. 12, fig. 5*A*.

Cuviera physcinodes H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 162-163.

"Leaves large, 20 to 30 cm. long, 7.5 to 11 cm. broad, with thick petiole, ovate-oblong or oblong, shortly and obtusely acuminate, equilateral at the base, coriaceous, glabrous on both sides. Ovary 5-celled; stigma glabrous. Drupe oblong, 3 cm. long, about 1 cm. in diameter, acute at the apex, acuminate at the base, without ribs.

"It is a tree-like shrub about 3 m. high, with large, leathery leaves. The cymes are axillary, with many flowers, short, ramified; only a few of the greenish white flowers produce fruit, though all seem to possess well-developed ovaries. The cylindrical internodes, covered with gray bark, are regularly thickened in their upper part, but do not develop swellings there. The swellings are situated rather above, and close to the nodes" (K. Schumann, 1888).

Gaboon: Sibange farm, type locality (Soyaux).

The myrmecodomatia of this species have been briefly described by K. Schumann from dried specimens. One of the hollow, nodal swellings had a length of 3.5 cm. and greatest diameter of about 1 cm., the wall being about 1.5 mm. thick. The inner cavity was nearly spindle-shaped and ended slightly below the node; three openings led into the cavity; one of these, 2 mm. long and 1.5 mm. broad, was probably alone used as entrance, while the two others were reduced to mere slits, 1 mm. long and hardly 0.5 mm. wide. Traces of former holes, evidently closed by callus growth, could be seen on two other spots. A few remains of ants were found inside the swellings.

Cuviera plagiophylla K. Schumann

Cuviera plagiophylla K. Schumann, 1903, Engler's Bot. Jahrb., XXXIII, p. 353.

"A shrub with thick, fistulose-inflate branches, which, even when young, are glabrous. Leaves strictly sessile, linear-oblong, short acuminate, rounded at the base, strongly inequilateral, glabrous on both surfaces. Stipules tubular, villose internally. Flower panicle axillary, with many flowers. Bracts very long, linear, acuminate. Ovary 5-celled. Sepals free almost to their base, linear, acute. Corolla with very short tube; the lobes acuminate, moderately appendiculate, cristate dorsally. Style glabrous.

"The bush reaches a height of 5 m. The leaves are 28 to 30 cm. long and 8 to 9 cm. broad; they are crossed on each side of the midrib by about 16 stronger veins, which are more prominent on the under side, as are also the reticulate veins; they are black when dry. The stipules are 9 mm. long. The lobes of the calyx are 11 mm. long and somewhat obtuse. The corolla is greenish-white, 15 mm. long, of which 2 mm. is to be allowed for the tube; the appendages measure 5 mm.; the keels on the dorsal face of the lobes make the bud sharply 5-ribbed.

"The species is very distinct by the strictly sessile, very oblique leaves and the acutely keeled corolla-lobes" (K. Schumann, 1903).

Cameroon: Bipindi, near Lokundje (Zenker).

Cuviera subuliflora Bentham

Cuviera subuliflora Bentham, 1849, in Bentham and Hooker, 'Niger Flora,' p. 407.

Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 157.

"An arborescent shrub or small tree of 15 feet, glabrous. Branches subterete, smooth, opposite. Leaves oblong, shortly acuminate, oblique and hollowed or rounded or somewhat narrowed at the base, chartaceous, rather paler beneath, 6 to 15 by 2 to 4$\frac{3}{4}$ in.; lateral veins about 12 to 14 pairs, slender; petiole $\frac{1}{4}$ in. long; stipules deltoid, connate at the base, keeled near the apiculate apex, $\frac{1}{4}$ to $\frac{1}{3}$ in long, hairy within. Flowers numerous, on short pedicels, in divaricately branched axillary and lateral, subsessile, dichotomous panicles of 2 to 3 in. diameter; bracteoles linear, narrowed at both ends, $\frac{1}{2}$ to 1$\frac{1}{2}$ in. long, accrescent as well as the calyx-segments. Calyx whitish; segments narrowly or at length broadly linear, ranging up to 1 in. long. Corolla green; segments about $\frac{1}{2}$ in. long, lanceolate, caudate-acuminate. Style glabrous. Ovary 5-celled. Fruit 1 in. long, obliquely egg-shaped" (Hiern, 1877).

Fernando Po; on the sea shore (Vogel).

Southern Nigeria: Abo (Vogel).

Cuviera trilocularis Hiern

Cuviera trilocularis Hiern, 1877, in Oliver, 'Flora of Tropical Africa,' III, p. 157.

"A small glabrous tree. Branches subterete, smooth. Leaves ovate-oval, acuminate, rounded and suboblique at the base, thinly coriaceous, glossy, of nearly the same color on both sides, 4 to 5 by 1$\frac{3}{4}$ to 2 in.; lateral veins about 8 to 10 pairs; petiole $\frac{1}{4}$ to $\frac{1}{3}$ in.; stipules apiculate, ovate, keeled, $\frac{1}{5}$ in. Flowers on short pedicels, several together, in the terminal or subterminal axils; panicles 1$\frac{1}{2}$ to 2 in. diameter; common peduncle about $\frac{1}{2}$ in., bracteoles lanceolate, $\frac{1}{2}$ to $\frac{2}{3}$ in. long. Calyx-segments greenish white, $\frac{1}{2}$ in. long or rather more, linear-elliptical, acute, narrowed toward the base. Corolla shorter than the calyx; lobes lanceolate, caudate-acute. Style glabrous; stigma 10-sulcate. Ovary 3-celled" (Hiern, 1877).

Southern Nigeria: Old Calabar (W. C. Thomson).

ECOLOGY OF *Cuviera* IN THE BELGIAN CONGO

The representatives of this genus observed by me mostly occurred in low-lying or moist places, though not in those apt to be frequently flooded; raised river banks are favorite sites. Usually growing as shrubs or bushes, 2 to 4 meters high, under favorable conditions they may become small, pyramidal, bushy trees of 5 to 7 meters. The trunk is slender, erect, and destitute of branches below where it often, but not always, bears opposite, decussate, very sharp spines, 2 to 5 cm. long. The long, slender branches spread more or less horizontally and their tips hang down somewhat. In accordance with the decussation of the leaves, they are placed opposite each other in four regular rows. As a rule the upper part of the plant is unarmed, though in some specimens one finds in the axils of the leaves heavy, straight spines, evidently modified, aborted branches.[1] The leaves are very large, 10 to 25 cm. long, 5 to 11 cm. broad, borne on a short petiole (of about 1 cm.), entire and simple, thinly coriaceous, smooth and glabrous on both sides, dull green above, paler below; usually cuspidate or more or less acuminate at the apex, oblique and rounded or slightly heart-shaped at the base. The lateral nervures are rather thin, more conspicuous on the under side of the leaf, and number 8 to 10 on each side of the midrib. The stipules are connate into a short, loose sheath, which is keeled, acuminate, and about 0.5 to 1.5 cm. long. The base of this stipular sheath persists on older branches.

The plant is not often seen blossoming. Welwitsch, in Angola, found flowers in April and May and fruits in August; while in the Belgian Congo, flowering specimens were seen by Dewèvre in March (Lukolela) and by me in February (Penge), July (Kunga), and December (between Masisi and Walikale); fruits were found in January, 1915, between Walikale and Lubutu on a plant not in flower. From these very incomplete data, which may relate to different species, it would appear that *Cuviera* blossoms from December to July, yet it is quite possible that there is no definite flowering season, as is so often the case with bushes and trees of tropical rain forests.

Dewèvre in his field-notes accurately describes the flowers of *C. angolensis*. They are large, conspicuously colored, and placed as many as a dozen together in axillary, polygamous panicles, toward the upper end of the younger branches. The common peduncle is 0.5 to 4 cm. long, while the pedicels are very short, the flowers being subsessile in the axils of slender and narrow bracteoles of about 2.5 cm. The calyx is pale green, deeply cut into 3 to 5 elongate-lanceolate lobes, extending far over the corolla, and 1.5 to 7.5 cm. long. The corolla is short salver-shaped (hypocrateriform), fleshy coriaceous, mostly deep green; the tube is short, bright carmine red, which color extends as a median acuminate line or triangular spot over the upper side of each of the five lobes. These five corollar lobes are lanceolate or oval-acuminate, rigid, and spread into a star when in full blossom. The tube of the corolla bears inside a ring of silvery, shiny hairs directed downward. The five stamens are exserted, placed in the sinuses of the corollar lobes, around the ring of hairs; their filaments are slightly flattened, fleshy, carmine red; their anthers are yellow. The style is thick, columnar, carmine red, densely white pilose, and ends in a large, obtuse, cap-shaped, pale green stigma. Frequently the fruit is oblique or even curved and falcate; but this is due to the aborting of one or more of the ovules; when the fruit is normally developed it is an obovate, dirty yellow drupe, about 23 to 32 mm. long and 18 to 25 mm. thick; its surface is deeply furrowed, there being 5 heavily developed ribs with less prominent ones between them; the ripe fruit is crowned with the remains of the withered calyx. It is noteworthy that very few of the flowers produce fruit.

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[1] Kohl (1909, p. 164) and De Wildeman (1906, p. 297) also note that the branches of certain specimens of *Cuviera angolensis* are unarmed, whereas in others they are spinose. There is a possibility that these differences are of specific value.

Cuviera angolensis was recognized as a myrmecophyte by K. Schumann (1890, p. 121), who found unidentified ants in the domatia of Welwitsch's herbarium specimens. The first field-notes on this plant were made by Dewèvre in 1896 (De Wildeman and Durand, 1900, p. 124) and these were completed by Ém. Laurent (De Wildeman, 1916, pp. 296–299) and H. Kohl (1909, pp. 163–166). Their accounts agree in almost every detail with my own observations on Congo *Cuvieræ* as reported below. The following ants are known from *C. angolensis*.

Crematogaster africana (Mayr). Romée (H. Kohl, 1909, p. 164; Forel, 1909*b*, p. 69).

C. africana subspecies *laurenti* (Forel). Romée (H. Kohl, 1909, p. 164; Forel, 1909*b*, p. 69). In that locality the coccid *Stictococcus formicarius* Newstead was living inside swellings of *C. angolensis* also occupied by this ant (Newstead, 1910, p. 19).

C. africana subspecies *winkleri* (Forel). Eala (Ém. Laurent; see Forel, 1909*b*, p. 69).

Cuviera angolensis Hiern was the only member of the genus recorded from the Belgian Congo, where it is far from rare. I had opportunity to examine in several localities a number of *Cuvieræ*, all of which at the time I regarded as belonging to this species, since they agreed with its description. While studying the anatomy of *Cuviera*, Prof. Bailey discovered certain histological dissimilarities between specimens collected at different places, yet it is possible that these discrepancies are due either to the difference in the age of the various branches or to their mode of preservation. In view of the fact that the number of African species has been so increased recently, the *Cuvieræ* of the Congo Basin will need considerably more field study before their identity can be safely discussed. Meanwhile, my notes are presented separately for each of the specimens I examined.

1.—At Avakubi (January 6, 1914; Coll. No. 1796) a *Cuviera* was found growing on the banks of the Ituri River. It was a low bush (4 to 5 meters high), well answering the general description given above, but without flowers or fruit; flower buds were, however, noticed a few days later on another specimen in the same locality. The trunk was cylindrical, and neither swollen nor hollow. Most of the branches showed at each node a spindle-shaped swelling which extended over the lower two-thirds to three-quarters of the internode, and was about 8 to 10 mm. thick and 6 to 7 cm. long. Notwithstanding the fact that expanded portions were almost completely hollow, their solid, woody walls made them very resistant to pressure. They were present even on young limbs and early became hollow, through the drying of the medullary tissue, before being attacked by ants.

On some of the branches the swellings contained a beetle larva feeding on the remains of dried pith, but there was always an orifice by which the insect had entered the stem. Some of these beetle larvæ were accompanied by coccids, though no ants were associated with them in the cavity. This is of great interest because it shows that the coccids enter the domatia of their own accord as soon as an aperture is pierced.[1]

The majority of the swellings of older limbs were inhabited by ants of different species, the most common being an unidentified *Crematogaster*. I further collected in other domatia of the same plant *Cataulacus pilosus* Santschi and *Technomyrmex hypoclinoides* Santschi. All of them had established in the cavities regular formicaries with larvæ and pupæ. In the case of the swellings tenanted by *Crematogaster*, each sheltered a separate colony, with its own queen, a number of workers, and abundant brood. Furthermore, the younger swollen internodes on the upper end of the branches were often occupied by a solitary queen, some-

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[1] Kohl (1909, p. 165) also mentions the presence of an insect larva, together with scale insects, in some of the swellings of *Cuviera angolensis*.

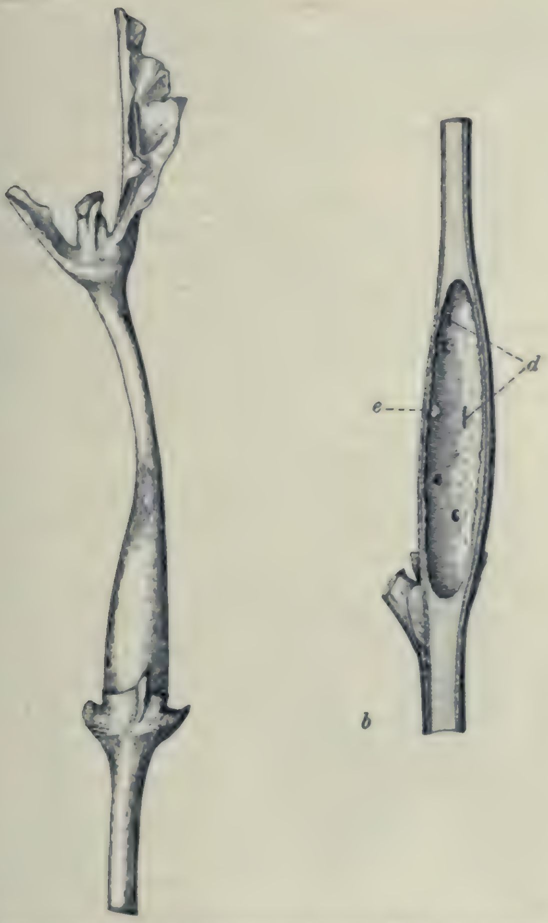

Fig 99. *Cuviera angolensis* Hiern: a, upper portion of branch with one of the caulinary myrmecodomatia above the node; *b*, longitudinal section of one of the swellings; *c*, aperture gnawed by the ants and leading into the cavity; *d*, pits often occupied by coccids. Drawn from alcoholic specimens collected at the Tshopo River, near Stanleyville; natural size.

times in company with a few coccids, the exit hole being partly closed by callus growth. Working down the branch, one frequently met with all stages in the development of the colony, ending with the appearance of the winged, sexual phases. It thus appears that the various colonies in a single *Cuviera* do not fuse into one great community as is the case with the *Pachysimæ* of *Barteria* and the *Viticicolæ* of *Vitex Staudtii*, yet they manage to live peacefully side by side.

The three species of Formicidæ found in this *Cuviera* were small and timid, and showed no aggressiveness, remaining inside the domatia when the plant was disturbed. They could not have been of much value as guards against phytophagous insects or other enemies. Indeed, numerous leaves of a specimen densely populated by ants were noticeably eaten by caterpillars.

2.—A *Cuviera* found at Penge (February 13, 1914; Coll. No. 2461), along the Ituri River, agreed in every particular with the specimens from Avakubi described above. It was in full bloom and all of its swellings were occupied by an unidentified *Crematogaster*.

3.—Another *Cuviera* collected near the village of Masaki, between Masisi and Walikale (December 31, 1914; Coll. No. 6429), also agreed entirely with the plants from Avakubi. Its swellings were occupied by two different ants, *Engramma denticulatum* Wheeler and *Tetramorium meressei* Forel, each in domatia of its own.

4.—The above remarks further apply to a *Cuviera* collected in fruit near Sitaweza, between Walikale and Lubutu (January 13, 1915; preserved in my herbarium without Coll. No.). In this case the inhabitants were *Crematogaster excisa* subspecies *andrei* (Forel).

5.—Along the Tshopo River, near Stanleyville, Mr. H. Lang and I collected, March 8, 1915, much material of *Cuviera* which was abundantly settled by the ant *Crematogaster africana* subspecies *laurenti* variety *zeta* (Forel). Figure 99, drawn from alcoholic specimens, shows the outer and inner structure of the domatia, which were in every respect similar to those of the plants observed at Avakubi, Penge, Masaki, and Sitaweza. Prof. Bailey states that, compared with the swellings of the Kunga specimens, those of the plants from the Tshopo are "shorter, slimmer, and of a deep olive green color"; in addition, the cortex and bast are relatively free from "amber-colored substance" and the pith cells which contain this substance are diffused, with a peripheral row scattered along the inner margin of the stele. These Tshopo examples are referred to as "*Cuviera angolensis*" in Prof. Bailey's anatomical studies (Part V, p. 593).

6.—At Kunga, north of Malela, Mr. H. Lang and I found a *Cuviera* (July 11, 1915; Coll. No. 7983) inhabited by numerous ants, *Crematogaster impressiceps* variety *frontalis* Santschi. The myrmecodomatia (Fig. 100) are longer and broader than in the specimens from the Tshopo River and of a reddish green color. The histological structure of the stem is also somewhat different; the "amber-colored substance" is concentrated in the subepidermal and other cortical cells, whereas the

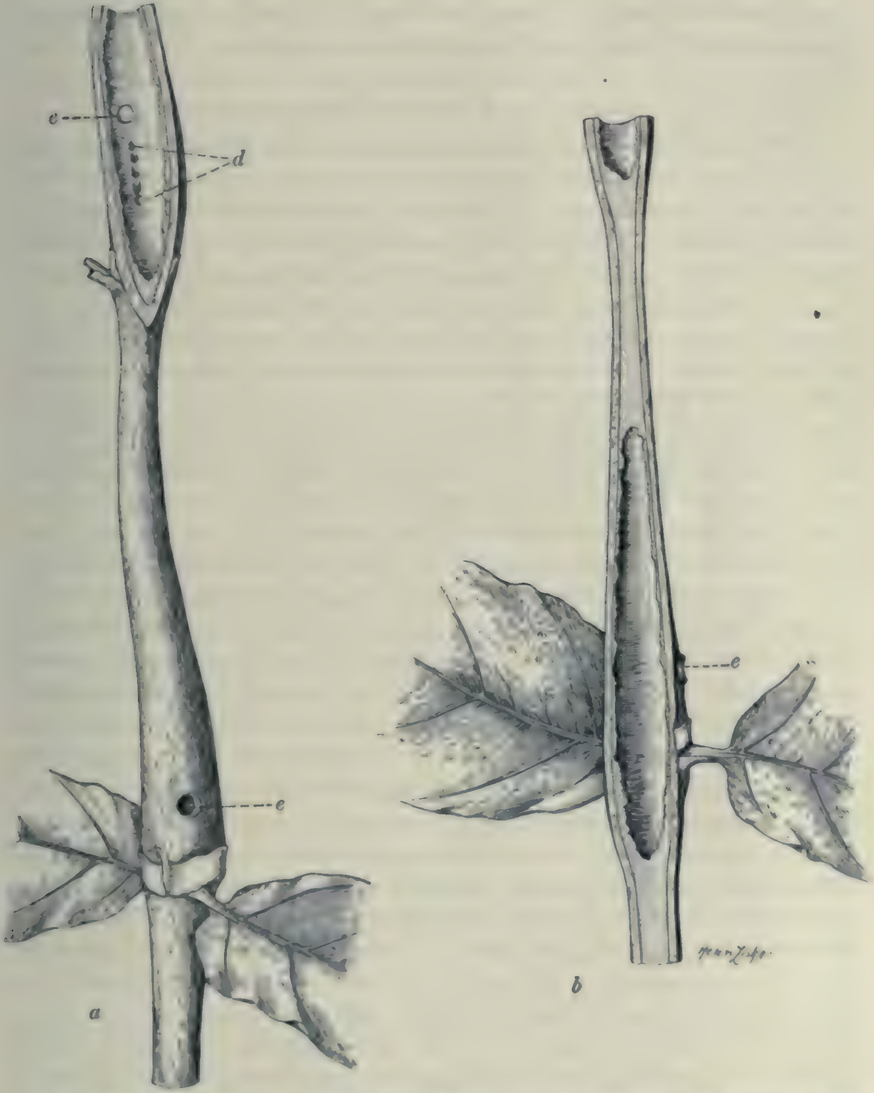

Fig. 100. *Cuviera* species? a, portion of branch giving external view of one of the domatia and the longitudinal section of another; *b*, longitudinal section of one of the domatia; *e*, aperture gnawed by ants. *d*, pits often occupied by coccids. Drawn from herbarium specimens obtained at Kunga, near Malela; natural size.

pith cells containing it are aggregated in the center of the more deeply lobed medulla (Bailey). The plant from this locality is referred to as "unidentified *Cuviera*" in Prof. Bailey's contribution (Part V, p. 593).

3. SYNOPSIS OF RECORDED MYRMECOPHYTES

The study of ant-inhabited plants is in such an incomplete state that no adequate or standard definition of the term "myrmecophyte" has so far been formulated. The student must therefore be prepared, in reading the present synopsis, to meet with cases of very unequal value. Warburg (1892, p. 130) has proposed to classify plants according to the nature of their relations with ants into the following three groups:

a. MYRMECOTROPHIC plants provide only food to the ants, either in the form of sugary exudates (nectaries,) special food-bodies (bromatia of the fungi), seeds or fruits of the myrmecochores, and the like.

b. MYRMECODOMIC plants furnish only shelter to the ants' nests, either in normal cavities, such as hollow stalks, or in special swellings or myrmecodomatia.

c. MYRMECOXENIC plants act as true hosts, offering to their ant guests both shelter and food. Typical cases of the kind are *Cecropia adenopus* (with the Müllerian bodies) and *Acacia cornigera* (with the Beltian bodies).

The term "myrmecophyte" is here used to include Warburg's "myrmecodomic" and "myrmecoxenic" plants. A further distinction of these two categories seems very unwise at present, because we are, it appears, just beginning to understand the true relations existing between ants and the plants they inhabit. My definition of "myrmecophytes" is based on practical considerations and is thus merely provisional. In the main, however, I agree with Ule (1906*b*, p. 335), who proposes to designate as ant-plants all plants which are steadily inhabited by certain species of ants, excluding only cases where the ants occasionally settle in normal leaf-sheaths, slits in the bark, dead branches, etc. Schumann's (1888) definition, on the other hand, is quite teleological and therefore of little use under present circumstances, since he wishes to restrict the term "myrmecophyte" to those plants "that are not merely visited by ants, but are purposely inhabited by them, and that therefore have probably entered with them into a true symbiotic relation."

The exquisite manner in which many ants have come "to know plants" (Michael Gehlerus, 1619) must indeed astonish the botanist who is but little acquainted with the psychic activities of these tiny insects. In his search for a much-needed explanation he naturally turns to the magic action of "Natural Selection," following in this the general trend of present ecological botany. Various theories of myrmecophytism are fully exposed and critically discussed by Prof. Bailey in part V of this

Report (pp. 610–614), so that a further consideration of this interesting topic is unnecessary here.

The origin of the various plant structures used by ants for nesting or feeding purposes is a purely botanical problem.[1] To the myrmecologist, on the other hand, belongs the task of tracing the various modifications of ant behavior which have gradually led to the close, obligatory cœnobiotic associations of certain Formicidæ with certain plants. It is not difficult to show that here, as elsewhere, the specialization in the habits of ants has followed its own course, quite independently of any simultaneous changes in the structure of plants.

Numerous ants belonging to many genera of the higher groups, viz., the Pseudomyrminæ, Myrmicinæ, Dolichoderinæ, and Formicinæ, establish temporary shelters or permanent colonies in dead branches, stumps of trees, dry stalks of herbs, and like places. In what perhaps may be regarded as the most primitive stage of this behavior, the ants merely appropriate existing cavities, such as old burrows of wood-boring larvæ, empty galls, and hollow pith channels. Dry stalks of grasses, reeds, and other herbaceous plants are also great favorites as nesting sites with many tropical ants (Forel, 1896*a–d*). At Luali, Belgian Congo, I found in August, 1913, a beautiful and populous nest of a *Camponotus* established in a dry stalk of papyrus on the bank of the Shiloango. Tucker (1911, pp. 24 and 26) mentions finding nests of the North American *Crematogaster lineolata* Say subspecies *læviuscula* Mayr variety *clara* Mayr, at Alexandria, Louisiana, in corn-stalk cavities formed by a borer and also in hanging "bolls" or fruits of cotton. The common *Lasius niger* (Linnæus) was observed in Europe in fallen apples, temporarily occupying the empty galleries made by the apple-moth (Ruzsky, 1913, pp. 61–63).

In many cases ants excavate new galleries in dead or decaying vegetable tissues or transform the fibres into "carton" used as partitions or plugs. One of the most typical of these borers in dead wood is the common *Camponotus caryæ* (Fitch), several forms of which occur throughout the Palearctic and Nearctic Regions (Wheeler, 1910*c*, pp. 219–220). Many species of *Crematogaster* and *Leptothorax* remove the pith from dead twigs of trees, briar and rose bushes, etc., to make homes for themselves (Forel, 1903*b*; Stäger, 1917 and 1919).[1] A peculiar cœnobiotic association was described by Wheeler (1912*a*) in the case of a mistletoe, *Phoradendron flavescens* variety *villosum* Nuttall, which grows on live oaks (*Quercus emoryi* Porter and Coulter) in the Huachuca Mts., Arizona. The branches of this mistletoe are very frequently hollowed out for some distance by a curculionid larva; the beetle makes its exit through a round hole at the side of the twig and the deserted gallery is then usually occupied by a colony of *Crematogaster arizonensis* Wheeler. Furthermore, the walls of these formicaries are invariably covered with reddish coccids, *Pseudococcus phoradendri* Cockerell. In the tropics of both hemispheres, many species of *Cataulacus* (Paleotropical) and *Cryptocerus* (Neotropical) are true wood-boring ants. Similarity in habits has gradually resulted in a remarkable resemblance in the shape of the head and the flattened body of these two genera, though they are not closely related to each other.

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[1] In a recent publication, Chodat and Carisso (1920) argue that the caulinary swellings of myrmecophilous plants are mere galls caused by the sting of insects and subsequently settled by the ants. They base their conclusion on the fact that they found insect larvæ in various stages of development inside the swellings of *Cordia glabrata* de Candolle, *C. longituba* Chodat and Vischer, and various other species of this genus, and also inside the swollen stipular thorns of *Acacia cavenia* Hooker and Arnott. This view, however, has not found much favor with other investigators (see De Wildeman, 1921). In the cases of the African *Barteria fistulosa*, *Cuviera*, *Plectronia Laurentii*, *Randia myrmecophyla*, etc., there can be no question but that the myrmecodomatia are normal, hereditary organs of the plant and that insects take no part in their production. This is undoubtedly also true for the swollen thorns of the Central American bull-horn acacias, which reach their characteristic size and shape even under cultivation. It must further be pointed out that the mere presence of insect larvæ feeding inside plant swellings does not necessarily mean that these swellings are galls made by the insects, whose occurrence there may be purely accidental. Many years ago Fiebrig (1909) noticed that caterpillars frequently destroy the pith of the swollen thorns of *Acacia cavenia*. Moreover, that insect galls have been and still are mistaken for true myrmecodomatia has been shown elsewhere (pp. 371–375), so that each particular case must be examined with the utmost care, in order to ascertain its true standing.

The keenest carpenter ants, such as the holarctic *Camponotus herculeanus* (Linnæus), with its various races and varieties, and the European *C. vagus* (Scopoli), frequently extend their burrows into the live, healthy wood of standing timber. It is, however, among the tropical and subtropical Pseudomyrminæ that we find all transitional stages between the common wood-boring habit and the more specialized behavior of nesting inside living, normal organs of plants and myrmecodomatia. The impulse to gnaw through living vegetable tissues not only presupposes a greater inquisitiveness on the part of the ants, but it is undoubtedly also influenced by the anatomical structure and chemical composition of the plant, as is clearly shown by Prof. Bailey's histological study of myrmecophytes (See Part V, p. 585–621).[2] From the habit of boring into normally existing cavities of plants it is only a step to the excavating of the pith of living branches, which brings us then to the settling of the so-called myrmecodomatia. That pith-nests, such as those described for *Endospermum formicarum* Beccari by Dahl (1901) in New Guinea, have been so seldom noticed is probably merely due to a lack of proper investigation.

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[1] In January, 1910, I found several nests, with queens and workers, of *Leptothorax angustulus* (Nylander) variety *bruneus* Santschi inside dead, hollowed stalks of wild roses near Algiers. The commom North American *L. curvispinosus* Mayr usually nests in hollow twigs or stalkes.

[2] The larvæ of many Hymenoptera, such as the Tenthredinidæ and Siricidæ, most Cynipidæ, and certain Chalcididæ, are phytophagous, feeding on the living tissues of healthy, growing plants. It may not be so commonly known that as adults, too, some of them attack living parts of plants. Certain of the larger saw-flies are known to injure twigs of bushes by girdling them with their mandibles. The large hornet, *Vespa crabro*, gnaws the new bark of trees in order to get building material for its paper nests. A number of tropical and subtropical bees and fossorial wasps are known to excavate nesting galleries in the green, juicy pith of living plants. According to Brauns, this is one of the peculiarities in the behavior of certain South African *Xylocopa*, *Ceratina*, and *Dasyproctus*. I have observed similar habits in species of *Allodape* and *Dasyproctus* in the Belgian Congo. Bertoni, in Paraguay, found *Xylocrabro umbrosus* Schrottky nesting in the green stalks of radish which ripens its seed about the time the young wasps are hatching.

In the following pages an attempt is made to review the various cases of true myrmecophytism which have thus far been recorded, as the pertinent observations are quite scattered in entomological and botanical publications. In this list the plants are arranged according to their systematic sequence. I have added a few remarks on distribution, a short description of the myrmecodomatia, and a record of the ants found therein. The available information is, however, often very scanty. So far as possible, doubtful or erroneous observations have been excluded or expressly questioned, while the recording authors are given in each case. The dates refer to the appended bibliography.

PTERIDOPHYTA

Polypodiaceæ

A cosmopolitan family, containing some 100 genera and 2800 species.

Polypodium Linnæus. Cosmopolitan, with about 200 species; some of the Oriental species are well-known myrmecophytes.

P. sinuosum Wallich. Malay Region from Malacca to the Solomon Islands. Inhabited by *Technomyrmex albipes* (Smith), an ubiquitous ant (Yapp, 1902; Ridley, 1910; Shelford, 1916); also by *Iridomyrmex myrmecodiæ* Emery in Borneo (Wheeler, 1919, p. 100) and in Java (Miehe, 1911*b*), and by *I. cordata* (Smith) in New Guinea (Beccari, 1884).

P. lomarioides Kuntze. Malay Region (Yapp, 1902).

P. sarcopus De Vriese and Teysmann. Celebes (Yapp, 1902).

P. imbricatum Karsten. Amboina.

P. leiorhizon Wallich. Eastern Himalaya, Western China.

These five species constitute the subgenus *Aspidopodium* Diels (=*Myrmecophila* Christ). They are epiphytic ferns, with creeping, semicylindric rhizomes, which are fleshy and much swollen on the upper side where the leaves are inserted on mammate protuberances; the flattened under side is pressed against the support. Originally the swelling is filled with an abundant aquiferous tissue, which in drying up causes the rhizomes to be tunnelled almost their whole length. The resulting cavities are, as a rule, inhabited by ants which pierce the entrances (Gœbel, 1888; G. Karsten, 1895).

A species of *Polypodium* (?*P. megalophyllum* Desvaux = *P. Schomburgkianum* Kuntze) of South America (Rio Negro; Rio Napo) is said to have rhizomes similarly swollen and occupied by ants. A Costa Rican species, *Polypodium Brunei* Werckle, possesses small bulbs, about 2 to 2.5 cm. in diameter, fixed by short peduncles at the sides of the rhizome; these bulbs are hollow, provided with an orifice, and divided by partitions into four or five spacious chambers. G. Senn (1910) regards them as water reservoirs; whether they are occasionally inhabited by ants is not known. *Polypodium bifrons* Hooker, of Brazil, has similar swellings which, according to Ule (1906*b*), act also as water reservoirs and are not occupied by ants.

Lecanopteris Blume. Malay Region. Represented by four or five closely allied species, all epiphytes, with swollen, tuberiform rhizomes, traversed by a system of galleries inhabited by ants. The genus is doubtfully distinct from *Polypodium*.

L. deparioides (Cesati). Borneo (Shelford, 1916).

L. carnosa Blume (= *Polypodium patelliferum* Burck). Perak, Borneo, the Moluccas, Philippines, Celebes, Java (Yapp, 1902; Ridley, 1910; Shelford, 1916). Inhabited by *Crematogaster yappii* (Forel) and *C. difformis* F. Smith. Hooker believed that *L. carnosa* represented a teratological condition of *Polypodium lomarioides*, but this view has been discarded following Burck's (1884*a*) observations of this plant.

L. Curtisii Baker. Sumatra.

L. Macleayii Baker. Java.

Some of the Old World epiphytic ferns of the genus *Drynaria* Bory have been improperly included among the myrmecophytes. They are remarkable in having, in addition to the normal, fern-like leaves, others which are sessile, broad, superficially divided, and pressed against the support and the rhizome. Humus accumulates underneath the cover of these appressed leaves and is soon invaded by roots. Frequently ants nest in this humus, but their presence there is merely accidental and I agree with Gœbel (1888) that these cover-leaves ("Nischenblätter") can by no means be considered as myrmecodomatia. *Drynaria Laurentii* Christ is one of the commonest epiphytic ferns of the Congo Basin and shows all the peculiarities of the genus beautifully. *D. quercifolia* (Linnæus) is abundant in the Oriental Region, from India to Polynesia.

Pheidole javana Mayr subspecies *jacobsoni* Forel variety *taipingensis* Forel was found by v. Buttel-Reepen forming small colonies in the cavities of the irregularly thickened root of an epiphytic fern in Malacca

(Forel, 1913, p. 28). More details concerning this plant will probably be given in v. Buttel-Reepen's forthcoming paper on the biology of East Indian social insects.

MONOCOTYLEDONEÆ

Palmæ

An abundant family in tropical and subtropical regions, especially in South America and the Malay Region. Approximately 170 genera, with 1200 species, have been described. A small number of species have been found associated with ants but, with the exception of certain *Korthalsiæ*, they can hardly be called myrmecophytes.

Korthalsia Blume. Oriental Region. With twenty species, all of which are rattan-palms. While the ligule of the leaf-base usually forms a close, tightly fitting sheath, in a few species which constitute a special section, this organ is dilated into a rounded or oblong, bulky sheath or ocrea of a stiff papery texture, frequently perforated and occupied by ants of the genus *Camponotus*. Emery has expressed the opinion that these *Camponoti* belong to a special group of the genus, adapted to living in the ocrea of these palms.

K. scaphigera Martius. Malay Region (Beccari, 1884; Ridley, 1910; Shelford, 1916). In Sumatra Beccari found the ocrea of the leaves perforated on the sides and inhabited by *Camponotus hospes* Emery; in Borneo a related *Camponotus* was found in this palm. According to Ridley (1907, p. 216) the natives of the Malayan Peninsula call this palm "Rotan semut" or ant-rattan.

K. echinometra Beccari. Malay Region (Beccari, 1884; Ridley, 1910; Shelford, 1916). The ant found in Sarawak in this palm by Beccari was *Camponotus contractus* Mayr, which had cut an entrance. On passing near the plant one may hear the ants running along the walls of the ocrea, which acts as a resonator. Emery (1888, p. 529, footnote) described *C. contractus* variety *scortechinii* from specimens taken in the ocrea of *K. echinometra* in Perak. *Crematogaster difformis* F. Smith had settled in the ocreæ of specimens of this palm cultivated at Buitenzorg; it had not pierced an orifice, as did the *Camponotus* mentioned above, but merely made its way along the slight depression near the upper margin of the ocrea.

Camponotus contractus variety *buttesi* Forel, from Kwala Lumpur, Selangor (Malacca), was found in the hollow swellings of a plant called by the natives "Rotan udang," in which the workers make a peculiar noise at night (Forel, 1902, p. 463). According to Ridley (1907, p. 216), this is the Malayan name of *Korthalsia echinometra*.

K. angustifolia Blume. Malay Region. In Sumatra, Beccari found the ocreæ pierced with a hole and inhabited by *Camponotus korthalsiæ* Emery (Beccari, 1884).

K. horrida Beccari, *K. Scortechinii* Beccari, and *K. cheb* Beccari, all from the Malay Region, have a similarly constructed ocrea, with an orifice undoubtedly pierced by ants which have not been identified (Beccari, 1884).

Calamus Linnæus. About 150 species in the Oriental Region from India to tropical Australia and Polynesia; one species in tropical Africa.

C. amplectens Beccari. Borneo. The two lower segments of the leaves are folded back and embrace the stem so as to enclose it, the resulting cavity being inhabited by ants (Beccari, 1884; Shelford, 1916).

Dæmonorops Blume. Oriental Region. Represented by seventy species, all rattans. In several of them ants habitually make nests in the large, stiff flower-spathes, which often quite cover the flower-panicles. The genus is closely allied to *Calamus*.

D. Jenkinsianus Martius. Malay Region. Flower-spathes inhabited by a *Camponotus* allied to *C. mitis* (F. Smith) (Ridley, 1910).

Orchidaceæ

One of the largest families of plants, containing 500 genera and over 15,000 species. Cosmopolitan, but chiefly in warm and humid regions. The following cases of myrmecophytism are still doubtful and need closer investigation.

Diacrium Lindley. Epiphytes of the Neotropical Region; four species.

D. bicornutum (Hooker), of Trinidad and Guiana, has a swollen, spindle-shaped stem, which is normally hollow and perhaps regularly inhabited by ants (Rodway, 1911, p. 111). Schlechter[1] claims that even under cultivation the pseudobulbs form at their base a slit through which the ants gain access into the cavity.

Schomburgkia Lindley. Epiphytes of the Neotropical Region. Represented by thirteen or fourteen species, from Mexico to Guiana and Peru, several of which have hollow pseudobulbs.

S. tibicinis (Bateman), in Central America (from Mexico to Venezuela), has voluminous, elongated pseudobulbs, which are hollow, with a smooth inner lining and usually inhabited by ants; these go and come through a small opening pierced at the base of the pseudobulb (Ross,

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[1] 'Die Orchideen,' (Berlin), 1915, p. 214.

1909; O. Massias, 1901; the plant is represented on Pl. XXXIV of Step, 1913). This is apparently a true myrmecophyte. Mayr (1862, p. 720) has recorded *Neoponera villosa* (Fabricius) from the pseudobulbs of this orchid at Vera Cruz, Mexico.

Grammatophyllum Blume. Epiphytes of the Malay Region; four species.

G. speciosum Blume is one of the largest orchids known; the stem reaches a height of 4 m. and is thickened, especially towards the base; occasionally it shows galleries occupied by ants.

DICOTYLEDONEÆ

Moraceæ

Cosmopolitan family, though chiefly tropical, with 70 genera and about 1000 species. The only myrmecophytic members known with certainty belong to *Cecropia*. Schimper has described and figured *Ficus inæqualis* with swellings, supposed to be myrmecodomatia, on the branches, but Ridley (1910, p. 458) has shown that these swellings are accidental, pathological productions.

Pourouma guianensis Aublet, of South America, which is related to *Cecropia*, according to Rettig (1904), possesses trichilia at the base of the petiole which produce food-bodies similar to the "Müllerian bodies" of *Cecropia adenopus*; whether they are collected by ants is not known. Forel (1904*b*) mentions *Azteca duroiæ* Forel as having been found by Ule in the twigs of an unidentified *Pourouma* in Brazil.

Cecropia Linnæus. This genus occurs throughout tropical America from Mexico to Brazil. There are thirty to forty species, apparently very few of which (subgenus *Aztecopia* H. v. Ihering) are myrmecophytes. These latter shelter nests of various species of *Azteca* inside their hollow stems and also produce food for the ants in the form of so-called "Müllerian bodies." Many other species of this dolichoderine genus of ants nest in various locations or even build free carton nests in trees. It seems, however, that the species which inhabit the *Cecropiæ* are obligatory plant ants, being met with only inside these plants; the colonies perish when the trees die or are cut down.

Alfaro found inside the stems of an unidentified *Cecropia* in Costa Rica the following ants: *Azteca cæruleipennis* Emery, *A. alfaroi* Emery, *A. xanthochroa* (Roger), and *A. constructor* Emery (Emery, 1896*b*). Ule collected in Brazil *A. alfaroi* subspecies *cecropiæ* Forel from another species of *Cecropia* (Stitz, 1913*a*). Warming (1894) studied in Venezuela a species of *Cecropia* which he found inhabited by *Azteca instabilis* (F. Smith).

Cecropia adenopus Miquel (= *C. peltata* Vellozo, *nec* Linnæus). A common species on the east coast of Brazil between 28° S. lat. and the Equator (H. v. Ihering, 1907). The best account of this celebrated plant is given by Wheeler (1910*b*, pp. 305–310):

> The tree known as "imbauba" or "imbauva" is very slender and candelabra-shaped, growing to a height of 12–15 m. The trunk and branches are hollow except at the nodes, where there are thin transverse septa. The sap is colorless, not milky nor rubber-containing, as stated by some authors. The crown of foliage is meagre and consists of large, palmately lobed leaves. At some time of its life each node bears a leaf, the long petiole of which has at its base a hairy cushion, known as the trichilium, in which the yellow Müllerian bodies are imbedded. The cavities of older and larger trees are almost without exception tenanted by *Azteca muelleri* Emery, which perforates the septa and thus causes all the internodal cavities to communicate with one another, both in the trunk and branches. The ants do not, however, live in the smallest, still actively growing twigs. The just-fecundated queen enters the branches while the tree is still young (50 cm. to 2 m. high) at a particular point, a small depression at the upper end of a furrow at the top of the internode, where, as Schimper has shown, the wall lacks the fibrovascular bundles and is most easily perforated. Von Ihering calls the depression the "prostoma," the perforation which is formed in it the "stoma." The queen thus enters the internode by making a stoma and feeds on the tissue ("stomatome") which, according to von Ihering, soon proliferates over and closes the opening from the inside. In the small internodal cavity the first workers, six to eight in number, are reared, and these restore communication with the outside world by again opening the stoma.

Several females may each start a colony in one of the internodes of the same tree. Since later only one colony is found in a tree, v. Ihering supposes that the various primary colonies fuse to form one large community, after all except one of the queens have been killed. Such a fusion of workers from different colonies is, however, doubted by Wheeler. After the single community has grown and has perforated the septa, it starts a spindle-shaped carton nest in the bole, a little distance above the ground.

> This so-called "metropolitan nest," which was discovered by von Ihering, resembles the carton nests built by other species of the genus on the branches of *Cecropia* and other trees. Where the nest occurs the bole of the *Cecropia* presents a spindle-shaped enlargement, which von Ihering regards as a gall—"the largest known gall," but his figures and several of these nests recently acquired by the American Museum of Natural History prove conclusively that such an interpretation is erroneous. The wall of the hollow trunk where it encloses the nest, shows no structural modification except a bending outward of the woody fibers. About half the thickness of this wall is gnawed away by the ants from the inside, leaving a thin zone encircling the trunk, which naturally bulges out under the weight of the superposed trunk and crown of foliage. As there is no hypertrophy of the tissues in the spindle-shaped deformation, the term gall, as applied to a structure of such simple mechanical origin, is a misnomer. When the metropolitan nest is established the ants make a large entrance in

the adjacent wall of the trunk and through this and the other openings in the branches pass to and from the foliage (Wheeler).

Marcgravius in 1648 (p. 91)[1] first mentions the constant occurrence of ants in the cavities of the stem of a *Cecropia.* Belt (1874, p. 222) leads the series of modern writers with his studies of Nicaraguan *Cecropiæ.* In his opinion the ants protect the tree; he found the stems of *Cecropiæ* inhabited by three species of ants and also by coccids attended by these insects. Fritz Müller (1876 and 1880) described the origin of the colonies of *Azteca* in *Cecropia adenopus* in Southern Brazil and called attention to the oval depression or prostoma by which the ants always enter the hollow internodes. He also discovered the food-bodies produced between the hairs of the trichilium at the base of the petiole and saw that the ants carried them off to their abodes. Schimper's (1888) careful investigations brought to light additional facts; he proposed the term "Müllerian bodies" for the food-bodies produced by the trichilium. They are white, pear-shaped or oval bodies composed of cells rich in proteids and fatty oils, so they can not be regarded as excreta. Since they are of no use to the plant save to attract ants, Schimper believes that they were originally mucus- or resin-glands which have become highly modified through adaptation to the ants. A similar adaptation is found, he thinks, in the prostoma and the peculiar structure of the stem at that particular spot where only soft parenchym and mucus-vessels are present. Both F. Müller and Schimper consider the leaf-cutting ants (Attini) the chief enemies of the *Cecropia* against which the protection by *Azteca* is devised. These authors call the ant which they observed on *C. adenopus,* "*Azteca instabilis*," but, as shown by Emery, this is *A. muelleri* Emery and not Smith's *A. instabilis.* Later observers, such as Ule (1897, 1905*b*, 1906*b*), Rettig (1904), H. v. Ihering (1907), K. Fiebrig (1909), and Wheeler (1908*a*, 1913), have offered many objections to the Belt-Schimper hypothesis of symbiosis between *Azteca* and *Cecropia adenopus.* Among other points, it is very doubtful whether the leaves of *Cecropia* are particularly attractive to leaf-cutting ants; moreover, the foliage of older trees which are occupied by *Azteca* is often much eaten by sloths, caterpillars, and other insects. Rettig calls attention to the presence on the leaves of *Cecropia adenopus* of bead-like glands containing proteids and fatty oils and which are also collected and used as food by the ants.

H. v. Ihering found *Azteca nigella* Emery nesting in the internodes of younger plants, 2 to 3 m. high, while older plants with a "metropolitan nest" in a spindle-shaped swelling of the bole were inhabited exclusively by *A. muelleri* Emery; he believes that this is a case of dimorphism between the younger and older generations of workers in the same colony. He has, however, not given any conclusive evidence that such is the case, since he has not observed transitional colonies of these two forms.[1] H. v. Ihering also found *A. lanuginosa* Emery in *Cecropia adenopus*; he mentions the frequent occurrence of coccids (*Lachnodiella cecropiæ* H. v. Ihering) in the nests. In his opinion, the main food of the adult ants consists in the soft pith-parenchyma of the upper, still growing internodes, also in the Müllerian bodies. He was unable to find how the larvæ are fed.

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[1] John Ray (1688, p. 1373) reproduces Marcgravius' observations.

Fiebrig's (1909) observations were made in Paraguay on what he calls "*Cecropia peltata* L.," but what is evidently not the Central American *C. peltata* but *C. adenopus* of Brazil.[2] The internodes were practically always inhabited by *Azteca alfaroi* variety *mixta* Forel. The ants go only short distances from their exit holes, unless disturbed, when they become very aggressive. Fiebrig thinks that the main food of the ants is the Müllerian bodies, on which the larvæ are probably fed exclusively, while the workers may also eat soft pith tissues and feed on the sweet fruits of the tree. There is little doubt that *A. alfaroi* is wholly vegetarian, while most other species of *Azteca* are carnivorous. In Paraguay the internodes of *Cecropia* are very often invaded by caterpillars (*Heliothis* species). The very young larvæ of this moth were repeatedly observed in internodes where a queen ant had just started a new colony; later on the caterpillars crowd the ants out and finally occupy the entire branch and destroy even the septa.

Wheeler has called attention to the occurrence in Cuba and Porto Rico of species of *Cecropia* fully equipped with prostoma and Müllerian bodies, though never tenanted by *Azteca*, since this genus of ants is lacking on all the larger Antilles.

Cecropia lyratiloba Miquel. Under this name a swamp *Cecropia* of southern Brazil was studied by H. v. Ihering (1907). It possesses the same so-called myrmecophilous structures as *C. adenopus* and is also inhabited by a species of *Azteca*.

Cecropia sciadophylla Martius. Brazil. Inhabited by *Azteca emeryi* Forel (Ule).

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[1] Emery (1912, 'Gen. Insect., Dolichoderinæ,' p. 34) still regards *nigella* as a distinct variety of *A. muelleri*.

[2] Chodat and Vischer (1920, p. 235) assert that *A. adenopus* is the only species of the genus found in Paraguay.

Polygonaceæ

A cosmopolitan family of 800 species, belonging to 34 genera. The myrmecophytic forms are trees or bushes of South and Central America.

Triplaris C. A. Meyer. Tropical South and Central America. Represented by ten species, all of which have apparently hollow internodes, but the branches are not inflated, though they are usually inhabited by ants.[1] It has been claimed that in some cases the entrance to the cavity is preformed.

Emery (1894*a*) described *Pseudomyrma arboris-sanctæ* from Bolivia, in stems of a *Triplaris* (collected by Balzan); Ule found *Pseudomyrma sericea* variety *rubiginosa* Stitz (Stitz, 1913*a*) inside the stems of an unidentified *Triplaris* of Brazil.

Of his *Pseudomyrma arboris-sanctæ* subspecies *symbiotica*, Forel (1904, pp. 39–40) has this to say:

> I discovered this race in March 1896 at Dibulla, at the foot of the Sierra Nevada de Sta-Marta, Columbia, in the following manner. Having laid my hand on the trunk of a young, green tree, about 4 meters high, and with large leaves, I was stung, and discovered on the trunk this *Pseudomyrma*, the cause of the sting. Noting the agressive behavior of these ants, I suspected a symbiotic relation between the tree and them, for other *Pseudomyrmæ* which run on trees take to flight instead of attacking. Finding, however, no dry branch and no aperture, I was at first puzzled. On noticing some passing Indians, I had the tree cut down with their machetes. I then broke the flexible, fresh branches of the tree and found them all provided with a very narrow pith channel. These channels constituted, from one end to the other of all branches and twigs of the tree, the nest of the *Pseudomyrmæ*, which were occupying them in a file, with their males, their larvæ, and their nymphs, having just room to cross over one another notwithstanding the slenderness of their body. This curious habitation perplexed me much and I was wondering where the female foundress of the formicary might have entered this perfectly green tree, without any dry branch and apparently

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[1] One of the earliest records of myrmecophytism in *Triplaris* is that by Weddell (1849, pp. 262–263, footnote). This publication not being accessible to many myrmecologists, I have reproduced Weddell's notes below; they contain name and description of an ant which has apparently been overlooked by subsequent authors; the species is evidently a *Pseudomyrma* and perhaps the one known as *P. arboris-sanctæ* Emery.

"Le tronc, les branches et même les plus petits rameaux des espèces de ce genre sont fistuleux et servent d'habitation à une fourmi d'une espèce particulière qui exhale, lorsqu'elle est excitée, une odeur assez agréable, comparable à celle que répandent les Cicindèles. Si l'on vient accidentellement à toucher le tronc d'un *Triplaris* et surtout à lui imprimer un choc, on voit les fourmis surgir par centaines de l'intérieur de l'arbre par de petits canaux qui font communiquer avec l'extérieur son canal médullaire, et, si l'on ne s'éloigne au plus vite, on est bientôt couvert de ces hôtes dangereux dont la morsure est bien plus douloureuse en proportion que les piqûres d'aucun autre insecte que je connaisse.

"C'est une chose singulière que, à quelque époque de leur vie que l'on examine les *Triplaris* dans leurs forêts, on soit toujours sûr d'y rencontrer ces fourmis. Il est encore bien curieux que, dans les *Ruprechtia* que quelques auteurs réunissent encore aux *Triplaris*, on n'en trouve jamais.

"Je ne crois pas que cet insecte ait été observé dans d'autres conditions que celles que j'ai notées; sa forme linéaire est particulièrement adaptée à son genre de vie. J'ai eu occasion de l'examiner et même de souffrir ses atteintes dans bien des parties du Brésil, en Bolivie et au Pérou, et partout il m'a paru identique. Déjà plusieurs voyageurs ont signalé une partie des faits dont il vient d'être question, et ils ont rapporté la fourmi du *Triplaris* au genre *Myrmica* de Latreille; mais je ne sache pas qu'on lui ait donné de nom spécifique; on pourrait lui appliquer celui de *Myrmica triplarina*. Elle est ordinairement d'un brun clair. Sa longueur est de 6 ou 7 millimètres, et sa largeur de 1 millimètre; l'abdomen est cylindrique et un peu atténué vers son extrémité postérieure qui est poilue."

without any exit hole. After long, unsuccessful investigation of all the branches, I inspected the lower portion of the trunk and finally discovered there the remains of an early branchlet, dried and broken off, but with a pith cavity communicating with the central cavity of the very trunk. It is by this old branch that the *Pseudomyrmæ* came and went.

Warming (1894) has published some interesting information on a *Triplaris* of Venezuela, which he doubtfully identifies as *T. americana*. The ants found in this plant belonged to a species of *Pseudomyrma* which he calls "*P. mordax* Meinert," a name not backed by any description in the literature.

T. americana Linnæus. South America. The earliest accurate account of myrmecophilism in the genus *Triplaris* was published, it appears, by Robert Schomburgk (1838, pp. 264–267) for the species under discussion. After a description of this tree, which he found common on the sandy banks of the inland rivers in Guiana, and often overtowering the other vegetation, he continues:

> The uncautious botanist, who, allured by the deceptive appearance, should approach the tree to pluck the blossoms, would bitterly rue his attempt. The trunk and branches of the tree are hollow, like those of the trumpet tree (*Cecropia*), and provided with partitions, which answer to the position of the leaves on the outside. These hollows are inhabited by a light brownish ant, about two- to three-tenths of an inch long, which inflicts the most painful bites. Its antennæ are placed near the middle of the anterior portion of the head; mandibles triangular; peduncle of the abdomen with two rings; the anus hairy and provided with a sting or piercer. They fall upon their prey with the greatest virulence, and insert their mandibles almost instantly, as soon as they come in contact with any soft substance, emitting a whitish fluid; their bite causes swelling and itching for several days. If they find themselves captured, they attack and kill one another like the scorpions. The Arawak Indians call the tree Jacuna, and the ant Jacuna sae; the Warrows Epouahari, the literal translation being ant tree; the Caribis Itassi; the colonists, from its growth, "long John."

Richard Schomburgk (1848, II, pp. 449–450) also records his painful experience with the same tree, which he found growing on the banks of the Barima and Barama Rivers, British Guiana.

Penzig found the caulinary cavities of *T. americana*, cultivated at Buitenzorg, Java, occupied by *Dolichoderus bituberculatus* (Morteo, 1904).

T. Cumingiana Fischer and Meyer. Central America. Wheeler (1913) observed this species in Panama and writes about it as follows:

> These trees were 15 to 20 ft. high, with very slender trunk, smooth, light gray bark, and long, narrow, lanceolate leaves. When the trunk was cut down and split longitudinally, it was seen to have a very slender cavity in the centre and extending its full length, and communicating with a similar slender cavity in the centre of each branch. This continuous system of cavities communicated with the surface by numerous slender galleries, excavated by the ants, and terminating in small round orifices, which served as exits and entrances.

Each tree was occupied by a single large colony of *Pseudomyrma arboris-sanctæ* Emery. Wheeler adds: "as the *Triplaris* trees were isolated and as their bases must stand in the water during the rainy season, it is difficult to understand how the ants manage to exist, unless they remain rather dormant this season or find some hitherto unknown food supply on the foliage." Recent, unpublished observations of Prof. I. W. Bailey on *T. surinamensis*, in British Guiana, however, show that the cavities of *Triplaris* contain great numbers of coccids from which the *Pseudomyrmæ* obtain at least much of their food.

T. caracasana Chamisso and Schlechtendal. Venezuela. Trunk inhabited by ants (Karsten in Huth, 1887). Schimper (1888) examined branches sent to him by Ernst and curiously enough states that they presented no adaptations to ants: "the branches possess an inner cavity which is only 5–8 mm. wide and interrupted by diaphragms; round apertures, pierced by the ants, lead into the cavity." He does not believe that there is any true symbiosis in this case.

T. nolitangere Weddell. Brazil. Stem inhabited by ants (Huth, 1887).

T. surinamensis Chamisso and Schlechtendal. Brazil, Guiana. Myrmecophytic (Spruce, 1908).

T. Macombii Don. Smith. Guatemala. Wheeler (1913) says:

> This is a larger tree (than *T. Cumingiana*), often attaining a height of 30 to 40 ft., with more diffuse branches and large, coarse, ovate leaves. Early in January it began to put forth bunches of long, yellowish flower-spikes, which were covered with a deciduous sheath. The branches have much larger cavities than in *T. Cumingiana* and the septa at the nodes are not broken through. On examining the surfaces of the branches, each internode is seen to be surrounded near its distal end by a circle of lenticels, and one of these, for some unknown reason, often becomes considerably enlarged and bears a long slit-shaped impression. It is in this impression that the queen ant makes the circular perforation that permits her to enter and take possession of the internodal cavity.

The same observer found the cavities of this species occupied by several species of ants belonging to the genera *Crematogaster*, *Pheidole*, *Tapinoma*, and *Iridomyrmex*, but two species were especially common, a small, black, narrow-headed *Azteca* and the black *Pseudomyrma sericea* Mayr. None of these, however, are obligatory plant ants.

T. Schomburgkiana Bentham. Brazil. Inhabited by ants (Spruce, 1908). Ule (1917) found in this species *Pseudomyrma dendroica* Forel and *P. triplaris* Forel.

Pseudomyrma dendroica was originally described from specimens found by A. Gœldi in the pith channel of young, unidentified *Triplaris* on the Rio Purus, Brazil. Some of these plants having been introduced into the Botanical Garden at Pará, Gœldi observed that this ant soon invaded one the *Triplaris* of the Garden which thus far had not been inhabited (Forel, 1904, p. 41).

Ruprechtia C. A. Meyer. Tropical and subtropical South America. There are twenty species, most of which are said to possess solid branches; the following is perhaps an exception.

R. Jamesoni Meisner. Brazil. The stem and branches are hollow and inhabited by ants (Spruce, 1908).

Symmeria Bentham. This genus contains two species; one has been described from Senegambia; the other, *S. paniculata* Bentham, according to Spruce (1908), is an ant plant; it occurs in Guiana, northern Brazil, and curiously enough also in Sierra Leone.

Coccoloba Jacquin (including *Campderia* Bentham). Tropical and subtropical America. A large genus, with about 125 species; only one of them has been mentioned as a myrmecophyte, but the others should also be studied in this respect. The common sea-side grape, *Coccoloba uvifera* Linnæus, in Porto Rico, sometimes has ants nesting in some of the internodes; but these are facultative forms, such as *Camponotus sexguttatus* (Fabricius), more common elsewhere. This species, at least, cannot be regarded as a myrmecophyte (Wheeler, 1908a, p. 157).

C. parimensis Bentham. British Guiana, Brazil. The stem and branches are hollow, but not inflated, and are inhabited by ants (Spruce, 1908).

Myristicaceæ

A small, exclusively tropical family, which, according to Warburg's monograph (1897), contains 15 genera with about 240 species.

Myristica Linnæus. Indomalayan Region; eighty species. In two related species from New Guinea, the internodes are in places swollen and hollow; these swellings are irregularly scattered along the branches, and their inner cavities do not communicate with one another; they are inhabited by ants, which pierce the entrances, often slit-like and placed on the side facing the leaf of the lower node. Warburg (1897), who has studied their histology, concludes that these swellings are probably not hereditary, but produced by the irritation of the ants; he considers them true ant galls, not myrmecodomatia. There is, however, no experimental proof that ants can produce such swellings.

M. subalulata Miquel (=*M. myrmecophila* Beccari). This species has been studied by Beccari (1884) and Warburg (1892; 1897); the latter figures (1897, Pl. XI) coccids on the inner walls of the swellings.

M. heterophylla K. Schumann. Swellings on the branches inhabited by ants (Schumann, 1890; Warburg, 1897).

M. euryocarpa Warburg, of New Guinea, is perhaps also inhabited by ants.

It is still somewhat doubtful whether these *Myristicæ* are true myrmecophytes.

Monimiaceæ

Tropical regions of both hemispheres. Represented by 250 species, belonging to 30 genera.

Kibara Endlicher. Eastern India, Malay Archipelago. With about 14 species.

K. formicarum Beccari. New Guinea. The branches are hollow and swollen at the internodes just beneath the insertion of the leaves; ants live inside together with coccids (Beccari, 1877, 'Malesia,' I, pt. 2, pp. 189–192).

Anthobembix Perkins. New Guinea. Contains two species, one of which is a myrmecophyte.

A. hospitans (Beccari) (=*Kibara hospitans* Beccari). Branches club-shaped below the nodes; these swellings hollow, pierced with apertures and inhabited by ants (*Iridomyrmex scrutator* Smith) together with coccids (*Myzolecanium kibaræ* Targioni) (Beccari, 1877, *loc. cit.*).

Lauraceæ

Tropical and subtropical regions of both hemispheres. Includes 1100 species, belonging to 48 genera.

Pleurothyrium Nees. Brazil, Peru. There are five species, of which the following three have swollen, fistulose branches and probably are myrmecophytes (Mez, 1888 and 1889; K. Schumann, 1888).

P. cuneifolium Nees. Peru, Brazil. Pœppig has mentioned the occurrence of ants on this plant: "in ramulis revera fistulosis degunt formicarum agmina pessime pungentia." Slits, 1 to 2 mm. wide, serve as entrances to the cavities (Mez, 1889, p. 471).

P. Pœppigii Nees. Peru.

P. chrysophyllum Nees. Peru.

Ocotea Aublet. Tropics of both hemispheres. About 200 species, some of which have pouches or bullæ, more or less pronounced, placed in the axils of the side-veins and projecting towards the upper side of the leaf; such species are *O. phillyræoides* (Nees) of Brazil, *O. Mandonii* Mez of Bolivia, *O. Bernouilliana* Mez of Guatemala, and *O. bullata* E. Meyer of the coastal region of Cape Colony and Natal. In the last-named species the pouches are large pits with ciliolate orifices on the under side in the axils of the lowest one or two pairs of nerves, the pits corresponding to large hollow tubercles on the upper side. Whether these pouches are merely acarodomatia or occasionally settled by ants is not known.

Nepenthaceæ

Oriental Region, the Seychelles, and Madagascar. Only one genus, **Nepenthes** Linnæus, with some 60 species, one of which has been recorded as myrmecophytic, but the case needs further investigation.

N. bicalcarata Hooker fil. Borneo. The petiole of the pitcher-shaped leaves is curled up and, in the curled part, swollen and hollow. According to Shelford (1916), there is no evidence that this cavity is inhabited by ants; while Beccari (1884) saw an opening leading inside and apparently found ants in the swelling.

Rosaceæ

Cosmopolitan. Includes 1700 species, belonging to 102 genera.

Hirtella Linnæus. Tropical America, with forty species; one species occurs in Madagascar. Myrmecophytism seems to be exceptional in this genus, as is also the case in *Cola* and *Randia*.

H. physophora Martius. The cordate leaves have at the base of the blade a pair of compresso-globose sacs inhabited by ants (Spruce, 1908).

Leguminosæ

Cosmopolitan, with 12,000 species and 530 genera. This and the Compositæ are the largest families of plants.

Acacia Willdenow. Tropical and subtropical regions of both hemispheres. There are over 600 species.

The so-called bull's-horn acacias of Mexico, Central America, and Cuba are apparently true myrmecophytes; their stipular thorns are much enlarged and flattened or inflated; they are usually hollowed out by ants, which pierce an entrance below the tip of the thorn, more rarely near its base, and establish their nests inside; furthermore, the young leaves bear at the tips of their pinnæ, minute, bright yellow food-bodies (Beltian bodies)[1] which are eagerly collected by the ants and carried inside the thorns. These plants all grow in dry or semi-desert regions under conditions very different from those of other myrmecophytes.

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[1] Meneghini and Savi (1844), Fr. Darwin (1877), and A. F. W. Schimper (1888), who have studied the inner structure and development of these Beltian bodies, all agree that they are homologues of the glandular serrations which frequently occur on the margins of young leaves. Such glands often secrete mucus or resin and, as a rule, disappear at an early stage; while in the ant acacias they increase considerably, are filled with proteins and fats and, when not removed by the ants, finally drop off.

One of the Mexican species was figured and described by Francisco Hernandez in 1651 (p. 86, Cap. LIII) as *Arbor cornigera* or the Huitzmamaxalli ("forked-thorn") of the Aztecs. In accordance with the ideas of his time, Hernandez believed that the thorns themselves generated the ants: "generantur præterea intra corniculas formicæ quædam tenues fulvæque et nigricantes." Linnæus' *Acacia cornigera*, however, is an altogether different plant and was described from a cultivated specimen growing in the garden of George Clifford, between Haarlem and Leyden, Holland; its origin is unknown. In fact, until quite recently, such confusion existed in the classification of bull's-horn acacias that it is almost impossible to recognize the species on which ecological observations have been published by Belt (1874), Beccari (1884), Wheeler (1913), Wasmann (1915a), and others.

H. Schenck (1913, 1914) and W. E. Safford (1910, 1914, 1915) have shown that the bull's-horn acacias contain a number of more or less related forms which are probably only partly known; twenty-seven species have thus far been described. It must be expected that these numerous allied forms, which often differ markedly in size and shape of their thorns, will be found to harbor a corresponding variety of guest ants. Owing to the uncertainty of identification of the plants studied by various authors, the following list of ants will merely give a general hint as to the species which may be expected in these plants.

It may be of interest to note that some bull's-horn acacias have been cultivated in hothouses in Europe (Commelin; Linnæus; Beccari) and in certain botanical gardens of the tropics (in Java, Raciborski; in Ceylon, Ridley; in Gaboon and Cameroon, H. Schenck; also in Cuba, according to Wheeler). The thorns are then swollen and hollow, as on the wild-growing plants, but are not attacked by ants.[1] Raciborski (1900) remarks that the food-bodies of such acacias are not collected by the ants in Java and that this is true also for the Müllerian bodies of the *Cecropiæ* which he saw cultivated at Buitenzorg.

Belt (1874), in Nicaragua, found in the thorns of his "*Acacia cornigera*" specimens of *Pseudomyrma gracilis* (Fabricius), = *P. bicolor* Smith, and more rarely of a *Crematogaster*. Emery (1890 and 1891) has given a long list of ants found by Alfaro in the thorns of unidentified Costa Rican acacias; only three of these, however, *Pseudomyrma belti* Emery,

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[1] Dr. W. E. Safford kindly informs me that a number of bull's-horn acacias are now being cultivated in a greenhouse in Washington, D. C. In each case the swollen thorns have maintained their characteristic shape, in spite of the absence of ants. Prof. Wheeler saw two Central American bull's-horn acacias growing in the Botanical Garden of Port of Spain, Trinidad. All their thorns were inhabited by a native, black *Crematogaster* which had even enveloped some of the thorns with carton. The ants were extremely numerous and vicious.

P. spinicola Emery, and *P. nigrocincta* Emery, he considers obligatory acacia ants[1]: "these species occur only on acacias, while other species of the same genus burrow their nests in wood; all three pierce the thorns close to the tip, when they are still young and soft, as Belt describes it; never was more than one of these three species found on a single tree and in each case the ant inhabited all the thorns on the living branches of the acacia." When the branches die, these *Pseudomyrmæ* leave the thorns, which are then occupied by many other ants: *Pseudomyrma gracilis* variety *mexicana* Roger, *P. subtilissima* Emery, *P. nigropilosa* Emery, *P. künckeli* Emery, *Crematogaster brevispinosa* Mayr, *Cryptocerus minutus* (Fabricius), *Camponotus rectangularis* Emery, and others; some of these species may occasionally invade young thorns of living branches, but, as they often occur elsewhere, they must be designated as facultative guests of the plant.

Wheeler (1913) found *Pseudomyrma spinicola* Emery on "*Acacia sphærocephala*" in Panama, and *P. belti* Emery with its subspecies *fulvescens* Emery on "*A. cornigera*" and "*A. Hindsii*" in Guatemala. Dr. P. P. Calvert, moreover, sent him *P. belti* and *P. nigrocincta* taken from acacia thorns in Costa Rica. Wheeler agrees with Emery that these four forms are, so far as known, the only obligatory acacia ants of Central America; among the facultative acacia ants he mentions *Camponotus planatus* Roger, *Pseudomyrma gracilis* (Fabricius), and *Solenopsis* species, taken by him in Guatemala; also *Pseudomyrma nigropilosa* Emery found by Calvert in Costa Rica.

Wasmann (1915a) described *Pseudomyrma wasmanni* Wheeler, = *P. canescens* Wasmann, *nec* Smith, from the swollen thorns of "*Acacia sphærocephala*" collected at Tampico, Mexico.

South American ant acacias are thus far known from Paraguay only. J. Bohls collected there in woody, expanded thorns of an unidentified acacia eleven species of ants: *Pseudomyrma acanthobia* Emery and variety *fuscata* Emery, *Cryptocerus pilosus* Emery, *C. bohlsi* Emery, *C. peltatus* Emery, *C. quadratus* Mayr, *C. pallens* Klug, *C. pusillus* Klug, *C. grandinosus* F. Smith, *Crematogaster brevispinosa* Mayr, and *Myrmelachista nodifera* variety *flavicornis* Emery. In his report of this collection Emery (1896*a*) remarks: "I have found most of the thorns (sent by Bohls) which still contained ants, inhabited by *Pseudomyrma*, which had its narrow galleries burrowed in the wood. The large *Cryptocerus* had completely hollowed out the thorns occupied by them. The openings of the *Pseudomyrma* nests were placed not far from the tip, those of the other species pierced at various levels, often also several on one thorn." The only other observations on these interesting plants were made by Fiebrig (1909), who studied *Acacia cavenia* Hooker and Arnott in the Chaco of northern Paraguay; the thorns of this species are very large, 90 mm. long and 8 mm. wide, and usually inhabited by *Pseudomyrma fiebrigi* Forel; normal thorns are filled with pith; in those occupied by ants that substance is more or less removed and an opening is found below the tip. Frequently, however, the pith is destroyed by a caterpillar which pupates inside, the moth escaping through a hole near the point of the thorn. Fiebrig believes that the ants appropriate these excavated thorns, using apertures made by the moth. According to Chodat and Carisso (1920), the swelling of the thorns of *A. cavenia* is due to the sting of an insect, the gall thus produced being eventually settled by ants, after its maker has left it. I cannot agree with this explanation.

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[1] The terms "obligatory" and "facultative" as applied to acacia ants were proposed by Wheeler (1913).

In a foregoing chapter (p. 372) I have discussed the so-called ant acacias of East and South Africa and have given my reason for not regarding them as true myrmecophytes. In their case, the swellings of the thorns are typical insect galls, probably produced by a lepidopterous larva. When the gall maker has left, the empty shelters may be invaded by various ants, even before they are completely dry, thus simulating myrmecodomatia.

Sclerolobium Vogel. Tropical South America. Containing twelve species.

Only one of the species, *S. odoratissimum* Spruce, of Brazil (Rio Negro), is said to be myrmecophilous; its leaves have a large sac, furrowed along the upper face and extending upward from the knee of the petiole to the base of the second pair of leaflets (Spruce, 1908). It is possible that this pouch is merely an insect gall which, when empty, becomes settled by ants.

Humboldtia Vahl (=*Batschia* Vahl). Ceylon and British India. Represented by four species, one of which is myrmecophilous.

H. laurifolia Vahl. India. The swollen internodes are occupied by ants (Bower, 1886 and 1887; Schimper, 1903; Morteo, 1904; Ridley, 1910). Figured by Taubert, 1894, in Engler and Prantl, 'Die Natürl. Pflanzenfam.,' III, pt. 3, p. 143, fig. 80, and by A. F. W. Schimper, 1903, 'Plant Geography,' p. 147, fig. 83; this figure is also copied by Escherich (1906*b*) and Wheeler (1910*b*).

Escherich (1911*a*, pp. 46-47) re-examined *H. laurifolia* in the Botanical Garden at Peradeniya, Ceylon. He found that only comparatively few of the swollen internodes (at most 20 per cent in the Garden, as contrasted with 50 per cent in the wild state, according to Green) contained a number of species of ants that are also found nesting in other locations (*Technomyrmex*, *Tapinoma*, *Monomorium*, *Crematogaster*, etc.). Since the ants are not in the least aggressive and, furthermore, often keep coccids inside the domatia, he concludes that they are decidedly noxious to the plant, the more so since they frequently attract woodpeckers which damage the branches in order to feed on them and their brood.

Schotia Jacquin (=*Theodora* Medikus). Tropical Africa. There are twelve species, one of them possibly myrmecophytic.

S. africana (Baillon) (=*S. humboldtioides* Oliver). Cameroon, Spanish Guinea, Gaboon. The young branches often have swollen and hollow internodes settled by ants. There is still a possibility that these enlargements are mere insect galls, which are invaded by ants after being left by their makers (see above, p. 409).

Tachigalia Aublet (=*Cubæa* Schreber; *Tachia* Persoon). South America. Includes six species, all of which have inflated petioles inhabited by ants. *Pseudomyrma picta* Stitz and *Azteca brevicornis* (Mayr) were found in *Tachigalia* by Ule in Brazil (Stitz, 1913*a*).

T. caripes Spruce. Brazil. The trigonous petioles are mostly dilated at the base into a fusiform sac tenanted by ants (Spruce, 1908).

T. ptychophysca Spruce. Brazil. Like the preceding (Spruce, 1908).

T. formicarum Harms. Eastern Peru. The petiole is swollen and inhabited by *Pseudomyrma* (Ule, 1908).

Platymiscium Vogel. South America. Contains fifteen species.

The stem is hollowed and inhabited by ants, and even sometimes dilated at the nodes (Spruce, 1908).

Meliaceæ

Tropical and subtropical regions of the globe. Has 42 genera, with about 700 species.

Chisocheton Blume. Indomalayan Region. About thirty species.

C. pachyrhachis Harms. New Guinea. A tree with the nodes of the branches and the base of the petiole swollen and hollow; several apertures leading into the cavity (K. Schumann and K. Lauterbach, 1901, p. 382).

Aphanamixis Blume. Indomalayan Region. Includes eleven species.

A. myrmecophila (Warburg) (=*Amoora myrmecophila* Warburg). New Guinea. The branches are often swollen and excavated, even the younger upper portions, the growing extremity narrowing very abruptly;

several apertures lead inside the irregular cavities, which have smooth, brown walls; the swellings are inhabited by ants (Warburg, 1894, pp. 194–196).

Euphorbiaceæ

A large, cosmopolitan family, with 4500 species, belonging to about 250 genera.

Endospermum Bentham. Indomalayan Region to New Guinea. Includes twelve species, two of which are to all appearances true myrmecophytes.

E. moluccanum (Teysmann and Binnendijk). Amboina, Moluccas, Celebes. There is a question whether this species is myrmecophytic. According to Beccari, this is the plant figured by Rumphius (1741, II, pp. 257–259, Pl. LXXXV) as "*Arbor Regis*".[1] In the latter's description, however, a confusion may have been made between several plants; so that it is by no means sure that the following remarks concerning the myrmecodomatia of his *Arbor Regis* apply to *E. moluccanum:*

> Truncus, omnesque crassi rami nullo constant corde, sed excavati sunt, ejusque loco referti sunt plurimis magnis et nigricantibus formicis, quæ in una alterave parte truncum perforant, et fenestras quasi formant, perambulantes illum usque ad ramorum extremum tanquam murum concavum, ita ut hæc arbor solo ex cortice suum hauriat nutrimentum, tenuiores vero rami medullam gerunt, qualem *Sambucus* habet. Si quidam amputetur ramus, formicæ hæ magna vi ac celeritate excurrunt, mox circumstantes invadentes homines ac mordentes tanto impetu, ut periculosum valde sit huic accedere arbori, immo totum circa hanc solum mordentibus hisce animalibus repletur, quæ adpropinquantium etiam pedes infestant. Observavi autem Indos non ita horum morsus presentire per duram ipsorum cutim, ac nos, unde et intrepide ad illam accedunt arborem.

The relations of *E. moluccanum* to ants have apparently not been studied in the field since Rumphius' time.

E. formicarum Beccari. New Guinea, Bismarck Archipelago. In New Guinea, according to Beccari (1884), the branches are normally swollen and hollow toward their extremity; he found them inhabited by *Camponotus angulatus* Smith, which had apparently pierced the entrances to the cavities. Dahl (1901) describes this plant in the Bismarck Archipelago as having normal branches, filled with pith which is partly excavated by ants, *Camponotus* (*Colobopsis*) *quadriceps* (Smith).

Macaranga DuPetit-Thouars. Tropical and subtropical regions of the Old World. About 170 species, a number of which are myrmecophytic.

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[1] Merrill (1917) admits the correctness of Beccari's reduction of Rumphius' "*Arbor Regis*" to *E. moluccanum.*

Donisthorpe (1917) described *Dolichoderus* (*Hypoclinea*) *crawleyi* from Singapore, "associated with species of *Lecanium* (coccids) in hollow stems of *Macaranga*." Wheeler (1919, p. 77) also mentions *Crematogaster* (*Decacrema*) *decamera* (Forel) "from *Macaranga* with slightly trifid leaves" at Kuching, Borneo.

M. hypoleuca (Reichenbach fil. and Zollinger). Malay Peninsula, Sumatra, Borneo. Inhabited by forms of *Crematogaster* (*Decacrema*) *borneensis* (Ern. André) (Viehmeyer, 1916).

M. caladifolia Beccari. Borneo (Beccari, 1884).

M. formicarum Pax and O. Hoffmann. Borneo. A low tree with thick, hollow branches which are pierced with an entrance and inhabited by ants (Pax, 1914).

In these three species ants live within the hollow, slightly swollen stem and branches, and also underneath the lanceolate, erect, persistent bud-bracts in the axils of the leaves; food-bodies, white and globular, are scattered on the back of the young leaves between the raised veins. The food globules are most plentiful in plants not settled by ants, and have been seen carried about between the mandibles of these insects (Beccari, 1884; Ridley, 1910; Pax, 1914; Shelford, 1916).

M. triloba (Reinwardt). Malay Peninsula and Archipelago.

M. Griffithiana Mueller. Malay Peninsula.

M. Hulletii King. Malay Peninsula.

In these three species, the stems are also hollow and settled by ants; furthermore, the bud-bracts are reflexed into a ring-like pouch which almost completely surrounds the stem. The concave under side of the bracts bears abundant pear-shaped or globular, white food-bodies, which are much sought for by the ants and are conveyed to the nest in the hollow stem, where the larvæ are fed on them; the ants not only hide beneath the bracts but occasionally take their larvæ there. *M. Hosei* King possibly has similar myrmecodomatia. The ant of *M. triloba* is a *Crematogaster* near *C. daisyi* (Forel) (W. Smith, 1903; Ridley, 1910).

In an unidentified species of *Macaranga* of Sarawak, the bracts are very large, lanceolate, acuminate, deflexed, coriaceous, not appressed to the stem, but concave, thus providing a nidus or feeding ground for ants (Ridley, 1910).

M. saccifera Pax.

M. Schweinfurthii Pax (= *M. rosea* Pax).

The above two species are from Tropical Africa and have pouch-like stipules, which in *M. saccifera* are sometimes inhabited by ants of the genus *Crematogaster* (see above, p. 412).

Mabea Aublet. South America. Contains thirty species, some of which have long, hollow branches, often settled by ants (Spruce, 1908).

Sterculiaceæ

Tropical regions of both hemispheres. Represented by 820 species and 57 genera.

Cola Schott and Endlicher. Tropical Africa. With forty-five species. The following three closely allied forms have at the base of the leaf-blade a pair of pouches which are often inhabited by small species of *Engramma* (see above, p. 417).

C. Dewevrei de Wildeman and Durand.

C. Laurentii De Wildeman.

C. marsupium K. Schumann.

Scaphopetalum Masters. Tropical Africa. Includes eight species, two of which have an elongate pouch at the base of the leaf-blade often occupied by ants of the genus *Engramma* (see above, p. 422).

S. Dewevrei De Wildeman and Durand. Belgian Congo.

S. Thonneri De Wildeman and Durand. Belgian Congo, Cameroon.

Flacourtiaceæ

Tropical regions of both hemispheres. With 650 species and 84 genera.

Barteria J. D. Hooker. Tropical Africa. Includes four species, all of which probably have hollow or swollen internodes, normally inhabited by *Pachysima æthiops* (F. Smith) or *P. latifrons* (Emery); accidentally by other ants (see above p. 432).

B. Dewevrei De Wildeman and Durand. Belgian Congo.

B. fistulosa Masters. Fernando Po, Cameroon, Belgian Congo.

B. nigritana J. D. Hooker. Southern Nigeria, Cameroon, Spanish Guinea, Gaboon, (Belgian Congo?).

B. Stuhlmannii Engler and Gilg. German East Africa.

Gertrudia K. Schumann. New Guinea. With one species, *G. amplifolia* K. Schumann. It is a tree or shrub with branches "strongly swollen at the apex below the leaf-bud, hollow and with an aperture leading into the cavity (probably a myrmecodomatium)" (K. Schumann and K. Lauterbach, 1901, p. 455, Pl. xv). Perhaps this swelling is only an insect gall.

Melastomataceæ

Tropical and subtropical parts of both hemispheres; very abundant in America, where a few forms reach the Nearctic Region. Represented by 2800 species and 170 genera. With the exception of *Pachycentria*, which is a doubtful myrmecophyte, all the myrmecophytic members of this family are restricted to the Neotropical Region.

Tococa Martius. South America. Includes forty species which, with one or two exceptions, have ant-pouches on the leaves. Either all the leaves or only one of each pair have a hollow sac or pair of sacs at the base of the blade, or in the upper part of the petiole; these pouches are usually inhabited by ants (species of *Azteca*[1]).

T. disolenia Spruce. Brazil (Spruce, 1908).

T. bullifera Spruce. Brazil (Spruce, 1908).

T. macrophysca Spruce. Brazil (Spruce, 1908).

T. formicaria Martius. Brazil (Spix and Martius, 1831).

T. guianensis Aublet. Guiana. Aublet (1775) describes the two pouches which in this species are placed along the upper part of the petiole, each with an opening beneath the base of the leaf-blade; ants are usually found in them and from the description it would seem that they also inhabit the stem of the plant.

Microphysca Naudin. Northern Brazil and Peru. Contains two species, *M. quadrialata* Naudin and *M. rotundifolia* (Spruce), with pouches on the leaves.

Myrmidone Martius. South America. There are two species, both with sacs on the leaves shaped much as in certain forms of *Tococa*.

M. macrosperma Martius. Brazil (Spruce, 1908).

M. rotundifolia Spruce. Brazil (Spruce, 1908).

Maieta Aublet (including *Calophysca* de Candolle). South America. Includes eight species, probably all with ascidia serving as abodes for ants.

M. guianensis Aublet (= *M. hypophysca* Martius). Guiana, Brazil. The branches are fistulose and swollen at the nodes; the leaves also bear pouches (Spruce, 1908).

To judge from his figure, this is the unidentified melastomataceous plant alluded to by Belt (1874, pp. 223–224) in the following passage:

> In each leaf, at the base of the laminæ, the petiole or stalk is furnished with a couple of pouches, divided from each other by the midrib, as shown in the figure. Into each of these pouches there is an entrance from the lower side of the leaf. I noticed them first in Northern Brazil, in the province of Maranham; and afterwards at Pará. Every pouch was occupied by a nest of small black ants; and if the leaf was shaken ever so little, they would rush out and scour all over it in search of the aggressor. I must have tested some hundreds of leaves, and never shook one without the ants coming out, excepting one sickly-looking plant at Pará. In many of the

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[1] *Azteca traili* Emery was found in the ascidia of a melastomataceous plant by Schulz at Pará.

pouches I noticed the eggs and young ants, and in some I saw a few dark-colored coccidæ or aphides.

M. tococoidea (de Candolle). Brazil, Peru, Guatemala. A large bifid sac at the base of the petiole (Spruce, 1908).

Pachycentria Blume. Malay Archipelago. Includes twelve species. These are woody epiphytes, some of which have tuberous swellings on the roots, filled with a spongy tissue. Ridley did not find any ants inside these enlargements and doubts whether the plants are true myrmecophytes. It is probable that the swellings are merely tubers.

P. macrorhiza Beccari. Borneo. Tuberous and galleried roots inhabited by ants (Shelford, 1916).

P. microstyla Beccari. Borneo. Like the preceding (Shelford, 1916).

Medinilla Gaudichaud. India, Malay Archipelago, Oceania, Madagascar, tropical Africa. Contains over 100 species.

M. loheri Merrill. Luzon, Philippine Islands. Only one of the leaves in each pair is normal; the other is modified into a crop-shaped ascidium opening on the upper side with a slit. According to Loher's observations, this pouch is sometimes occupied by ants, the species of which is not stated (Solereder, 1920).

M. disparifolia C. B. Robinson. Luzon, Philippine Islands. The leaves have a similar structure as in the foregoing, and are perhaps also used by ants.

Loganiaceæ

Tropical regions of both hemispheres. Represented by 400 species and 35 genera.

Fagræa Thunberg. Oriental Region. Contains twenty-five species. In the three forms enumerated below, the base of the petiole bears auriculate appendages, which are curved downward and more or less pressed against the stem. The cavities thus formed are occupied by ants, which cover the opening with a papery substance and keep their brood inside (Burck, 1891).

F. borneensis Scheffer. Borneo.

F. imperialis Miquel. Sumatra.

F. auriculata Jack. Oriental Region.

Gentianaceæ

Cosmopolitan. Represented by 71 genera, with 900 species.

Tachia Aublet (=*Myrmecia* Schreber). South America. There are four species. Bushes or small trees. The stem and the long, slender branches are hollow. In the original description of *T. guianensis* Aublet, of Guiana, there is a note as follows: "Le tronc et les branches qui sont creux, servent de retraite aux fourmis; c'est pour cette raison que cet arbrisseau est nommé 'Tachi' par les Galibis, ce qui en leur langue signifie, suivant leur rapport, 'nid de fourmis'" (Huth, 1887; Spruce, 1908).

Apocynaceæ

Cosmopolitan, though chiefly in tropical regions. Represented by 165 genera containing 1300 species.

Epitaberna K. Schumann. One species, *E. myrmœcia* K. Schumann, in Cameroon: upper part of the internodes swollen, spindle-shaped, with a cavity inhabited by ants (see above p. 442).

Asclepiadaceæ

Cosmopolitan; chiefly in tropical and subtropical regions, and abundant in Africa. Represented by 267 genera, with 2200 species.

Dischidia R. Brown (including *Conchophyllum* Blume). Oriental Region. Includes fifty species. They are all twining epiphytes; a few are associated with ants.

D. Rafflesiana Wallich. Malay Region.

D. timorensis Decne. Malay Region.

In these two species a certain number of leaves are converted into cone- or pitcher-shaped pouches with an opening at the base through which roots project into the cavity; this pouch also contains soil and sometimes ants, which make regular nests there, with brood (Treub, 1883a; Beccari, 1884; Groom, 1893; Ridley, 1910). The seeds are scattered by ants (see above, p. 357). Beccari found *D. Rafflesiana* in Java inhabited by *Dolichoderus bituberculatus* Mayr and *Crematogaster brevis* Emery.

D. complex Griffith. Malacca (Pearson, 1902).

D. pectenoides Pearson. Philippines (Pearson, 1902).

D. Shelfordii Pearson. Borneo (Pearson, 1903; Shelford, 1916).

In the above three species a certain number of leaves are double pitchers; a small pitcher is found inside each large pitcher; the inner surface of the former is thickly beset with glandular hairs; the larger, outer pitcher is filled with soil and numbers of rootlets, which spring from the petiole or stem and grow through the orifice; in the outer one are found also numbers of ants, *Crematogaster difformis* F. Smith. "Microscopic examination of the inner surface of the outer pitcher revealed the presence of a dense waft of superficial mycelium which was easily removed on the point of a needle. The growth of this mycelium appeared to be radial, starting from the center of a curious rosette-like structure, formed by shorter hyphæ of a peculiar character. These bore a profuse crop of minute abstricted gemmæ. At the center of each rosette the tissue of the pitcher-wall appeared to have been punctured" (Pearson, 1902, p. 387).

The following three species are doubtful myrmecophytes: *D. Merguiensis* Beccari, of Tenasserim; *D. clavata* Wallich, of India; and *D. digitiformis* Beccari, of Celebes.

Borraginaceæ

Cosmopolitan. About 100 genera, with some 1600 species.

Cordia Linnæus. Tropical regions of both hemispheres. Contains 250 species. A few of the South American forms are apparently true myrmecophytes. Ule collected *Cryptocerus cordiæ* Stitz from an unidentified *Cordia* in Brazil (Stitz, 1913a) and *Azteca longiceps* Emery subspecies *cordincola* Forel was taken from the swellings of a Bolivian species (Forel, 1920a). Chodat and Carisso (1920) regard the caulinary swellings of the species of *Cordia* examined by them in Paraguay, as mere insect galls, subsequently occupied by ants. It can hardly be doubted, however, that they are true myrmecodomatia.

C. Gerascanthos Jacquin. Central and South America. Beccari (1884) noticed on herbarium specimens from Mexico, below the terminal verticil of branches, an obovate, hollow swelling of the stem with a lateral aperture; there were coccids, but no ants inside. Spruce (1908) found these swellings inhabited by ants; and Emery (1890) records *Pseudomyrma belti* subspecies *fulvescens* Emery from this plant in Guatemala; while *Azteca pittieri* Forel variety *emarginatisquamis* Forel occurred in specimens from Costa Rica (Forel, 1920a).

C. nodosa Lamarck. Brazil. Beccari (1884) and Spruce (1908) mention that the stems are swollen and hollow beneath the nodes and settled by ants. Schimper (1888) has studied the myrmecodomatia of this species near Pernambuco: below the false verticil of leaves, side twigs, and inflorescences which terminates the main branches, one frequently finds an elongate, pouch-like swelling which opens above by a small natural aperture placed between the leaves and branches of the false verticil. These pouches are often inhabited by small ants and in such cases their inner wall is covered with a dark brown, earthy crust evidently produced by the ants.[1] See also Rettig (1904). *Azteca stanleyuli* Forel and *A. olitrix* Forel were taken from swellings of *C. nodosa* collected near Pará, Brazil (Forel, 1920a).

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[1] It may be supposed that this dirty layer contains a mycelium as in the case of *Myrmecodia*.

C. longituba Chodat and Vischer. Chodat found in the swellings of this species in Paraguay nests of *Pseudomyrma chodati* Forel (Forel, 1920a).

C. miranda de Candolle and *C. hispidissima* de Candolle possess, according to Beccari (1884), similar myrmecodomatia; they form, together with *C. nodosa*, a special section of the genus (*Physoclada* A. de Candolle).

Verbenaceæ

Cosmopolitan, but mostly in tropical and subtropical climes. Represented by 900 species, belonging to 80 genera.

Clerodendron Linnæus. Tropical regions of the Old World. About 200 species.

C. myrmecophilum Ridley. Malay Peninsula, Sumatra, Borneo.

C. breviflos Ridley. Malay Peninsula.

C. fistulosum Beccari. Borneo.

These three species have normally hollow branches, which are often inhabited by ants (Beccari, 1884; Ridley, 1910; Shelford, 1916). According to Beccari and Shelford, the ant of *C. fistulosum* is *Camponotus* (*Colobopsis*) *clerodendri* Emery; it gnaws entrances to the hollow stem always directly below the insertion of the leaves, either on one or on both sides of each node; on plants free from ants, these spots are marked by a little circular patch of a texture and structure different from that of the surrounding parts. Beccari also describes and figures the internodes as markedly swollen, and more so towards their upper extremity.

An unidentified species of *Clerodendron* in the Belgian Congo also shelters ants inside its hollow branches (see above, p. 443).

Vitex Linnæus. Tropical regions of both hemispheres. With 120 species. Two myrmecophytic species have been mentioned as occurring in Africa, and probably some others also shelter ants inside their stem.

V. Staudtii Guerke. Togo, Cameroon, Spanish Guinea, Belgian Congo. Creeper with hollow stems and branches, which are inhabited by *Viticicola tessmanni* (Stitz) (see above, p. 447).

V. yaundensis Guerke. Cameroon.

Rubiaceæ

One of the largest families of plants: over 5000 species, classed under some 400 genera, have been described. They are cosmopolitan, though the majority are found between the tropics. About sixty-five species belonging to eleven genera present myrmecodomatia, this family thus containing by far the largest number of myrmecophytes.

Myrmecodia Jack.[1] Oriental Region, from Cochinchina and the Malay Peninsula to New Guinea, northern Queensland, the Solomon and Fiji Islands. There are eighteen species. All are epiphytic, low shrubs, with rhizomes swollen into basal pseudobulbs or tubers, occupied by anastomosing cavities which communicate with the exterior by means of numerous pores and are often inhabited by ants; the apertures seem to be formed naturally, without the intervention of the ants, at least in certain cases.

Beccari originally (1884) held that the galleries of the swollen rhizomes were the work of ants; that it was impossible for plants to reach maturity without the intervention of these insects; that the tunnelling by them caused the tuber to grow enormously, while its weight was not proportionally increased, the galleries thus enlarging the absorbent surface of the rhizomes.[2] Later he altered his views somewhat, as can be seen in the following quotation from his 'Wanderings in the Great Forests of Borneo' (1904, p. 405):

> At first I thought that the ants by the irritation they produced on young budding plants of *Myrmecodia*, favored the swelling of the base of the stem, and were the direct cause of such an hypertrophy. Further investigations and researches and the observations of Dr. Treub have, however, convinced me that from the very beginning these swellings appear independently of any action of the ants, and that when the latter are absent the tubers develop much in the same manner. I do not, however, think it equally certain that ants have no part in the formation of the internal galleries. My observations tend to prove that in some cases, in non-Bornean species of *Myrmecodia* (*M. alata* and *bullosa*), ants take an active part in the formation of the galleries and especially in that of the apertures which lead to them. But be this as it may, the hospitating Rubiaceæ live on a footing of reciprocal utility or mutualism with their inhabitants, which act as a formidable army of defence, for no animal dares to meddle with a plant guarded by a host of biting ants, ready to assault the imprudent invader in myriads.

H. O. Forbes (1880 and 1885, pp. 79–82) and Treub (1883, 1888) raised young *Myrmecodiæ* from seed and found that the tuber is a normal production of the plant and that the galleried inner structure arises in the absence of ants. Treub's investigations are of such importance that they should be considered more in detail. He saw that soon after germination and before the first leaves are formed, the axis below the cotyledons begins to enlarge and it is from this part of the plant that the whole tuber is produced. When the swelling is quite young the entire mass of cells, including the central bundle, is continuous; but when older, some of the central cells have dried up and thus form the first cavity whose inner walls are covered with a layer of suberose cells; later other galleries are formed, which at an early stage communicate with one another. Treub also apparently admits that the entrances to the cavities are produced by the *Myrmecodia* itself without any outside help. In his opinion, the tuber and inner labyrinth are normal ecological peculiarities of the plant, the latter being used for aërating purposes. The walls of the galleries are in some parts smooth and uniform, in others studded with little prominences, which Treub thinks are not, as originally supposed, glands secreting some fluid attractive to ants or absorbing organs for nutritive substances, but lenticels or rudimentary breathing organs. The ants he regards as mere opportunists who have taken advantage of the secure shelter afforded by the excavated tubers, but are of no visible utility to the plant.

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[1] Rumphius (1750, VI, p. 119, Pl. LV) first discovered the remarkable East Indian Rubiaceæ with ant-tubers. He distinguished two kinds: "*Nidus formicarum niger*" (*Hydnophytum amboinense* Beccari) and "*Nidus formicarum ruber*" (*Myrmecodia Rumphii* Beccari). He believed that not only the swellings but also the entire plant were produced by the ants! Beccari (1884) has given a complete account of the earlier history of these plants; it contains very little of interest to the ecologist and entomologist.

[2] H. N. Moseley (1879, p. 389) had before expressed the opinion that in *Myrmecodia* and *Hydnophytum* "as soon as the young plants develop a stem, the ants gnaw at the base of this and the irritation produced causes the stem to swell; the ants continuing to irritate and excavate the swelling, it assumes a globular form, and may become larger than a man's head." He also believed that these plants cannot thrive without the ants.

G. Karsten (1895) also disclaims the supposed symbiotic relations between the *Myrmecodiæ* and ants. He believes, however, that the cavities have not only a respiratory function, but that their inner walls can also absorb transpiration water condensed inside the tubers during the cooler nights and at the same time assimilate certain dissolved nutritive elements introduced by the ants or found in the excrement of these insects.

Rettig (1904) agrees with Karsten and Treub in explaining the peculiarities of the *Myrmecodiæ* and allied genera on the ground of the physiological needs of the plant. He notes that these epiphytes are light-loving, thriving in nature on branches which are much exposed to intense sunshine or even on rocks; the galleries of the tubers are filled with air and act as aërating tubes, which isolate the inner tissues and prevent the plant from drying out. This author does not discard Treub's idea that the pimples on the inner walls may be for respiration; he even observes that there is undoubtedly a current of air through the apertures, since fresh air enters during the cooler nights and partly escapes during the day. He believes, however, that in many cases rain-water enters the cavities through the openings and is then absorbed by the tuber; he has shown experimentally that such absorption can actually take place.

Our knowledge of the *Myrmecodiæ* has been materially increased by Miehe's (1911*b*) researches. According to his findings, the inner walls of the cavities of *Myrmecodia tuberosa* are, as a rule, clean; those in certain portions are smooth, of a brownish-yellow color, never covered with fungi, and the pupæ of the ants are always kept in such galleries only; others are blackish, strewn with paler papillæ, the dark color being due to a covering of fungus. This growth occurs only in tubers occupied by ants and, when opened, such cavities exhale a fresh mushroom odor. It is evident that the tips of the hyphæ are cut off by the ants and in some places whole sods of these filaments are trimmed evenly, yet Miehe believes that the insects do not feed on the fungus, but merely cut the hyphæ down because their growth would interfere with the ants' movements in the galleries. He thinks, however, that the mycelium grows on the excrement voided by the ants on the papillose portions of the walls only. The papillæ are evidently not rudimentary roots or root-buds, but Miehe calls them haustoria or suckers, since he learned from experiment that parts covered with them readily absorb water, while the smooth portions do not. In wild and in cultivated specimens he often found rain-water accumulated in some of the cavities. He notes that the *Iridomyrmex* of *Myrmecodia* is seldom seen outside the galleries, unless the plant be disturbed, on which occasions the ants rush out at once. Their food was not ascertained, nor whether they come out at night. They seemed to him provided with very feeble weapons.

Concerning *Iridomyrmex myrmecodiæ* in the Solomon Islands, Wm. M. Mann (1909, p. 362) gives the following account:

> This is one of the most abundant ants in the Solomons. It nests sometimes beneath bark or in crevices on standing trees, but usually in bulbs of an epiphyte, *Myrmecodia* species (?*M. Guppyanum*), which grows on the branches of several species of trees and is especially common on a lowland-inhabiting species of *Barringtonia*. It has been shown that *Myrmecodia* can thrive without the presence of ants, but I am sure that few of this species do, for among the many that I cut open, none were without them. Even very young bulbs, less than an inch in diameter, contained incipient colonies.

In a more recent paper W. M. Mann (1921, p. 406) mentions the common occurrence of various species of *Myrmecodia* and *Hydnophytum* in the Fiji Islands. Their bulbs are often inhabited by colonies of ants, *Iridomyrmex sororis* Mann, *I. nagasau* Mann, and its subspecies *alticola* Mann being the more common forms. *Pæcilomyrma senirewæ* Mann subspecies *myrmecodiæ* Mann and certain *Camponotus* and *Pheidole* also occasionally use such bulbs as nesting sites, though Mann remarks that many bulbs "contained no ants at all, but myriopods, spiders, scorpions, or geckos and their eggs."

Wheeler (1919, p. 111) records *Camponotus quadrisectus* (Smith) "from the distorted pseudobulb of a *Myrmecodia*" in Borneo and

Crematogaster difformis F. Smith subspecies *sewardi* (Forel) was also described from a Bornean *Myrmecodia.*

M. armata de Candolle. Java. As Rettig remarks (1904, p. 12, footnote), this is evidently the plant so carefully investigated in Java by Treub, and originally called by him (1883) "*Myrmecodia echinata* Gaudichaud." Later (1888), Treub agreed with Beccari that his former identification was incorrect but claimed, apparently with reason, that his plant was not *M. tuberosa* Jack. It is the species used by Rettig (1904) for some of his experiments and the one studied by H. Miehe (1911) under the name "*M. tuberosa* Beccari." Miehe found most of his specimens inhabited by *Iridomyrmex myrmecodiæ* (Emery); in one locality, however, exclusively by *Camponotus maculatus* subspecies *pallidus* (Smith). Beccari (1884) also mentions the occurrence of *Iridomyrmex myrmecodiæ* in the tubers of Javanese "*M. tuberosa*" (=*M. echinata* de Candolle).

M. tuberosa Jack. Sumatra, Borneo, and probably elsewhere in the Malay Archipelago. Beccari (1884) found in Bornean specimens *Crematogaster difformis* Smith and Shelford (1916), also in Borneo, *C. difformis* and *Iridomyrmex myrmecodiæ* (Emery). Shelford mentions that both ants are by no means restricted to the tubers of epiphytic Rubiaceæ, for they frequently nest in hollowed-out branches of various dead or living shrubs or trees.

M. bullosa Beccari. New Guinea, Amboina (G. Karsten, 1895). Inhabited by *Iridomyrmex cordata* (Smith) in New Guinea (Beccari, 1884).

M. Menadensis Beccari. Celebes. S. H. Koorders[1] gives the following interesting remark concerning this plant: "Especially common in the Minahasa in the lower plain to 1000 m. above sea-level in young forests, preferably in abandoned coffee-orchards. One sees there on most of the half-dead dadap trees (*Erythrina*) a number of these strange epiphytes. It is remarkable that as a rule I have found, on the same trees, one or more specimens of the following other curious myrmecophilous epiphytes with tuberous stem divided into chambers, viz., *Hydnophytum formicarum* Jack, *H. Selebicum* Beccari, *Polypodium sarcopus* DeVr. and Teysm. and *Polypodium carnosum* Christ, and of the most peculiar *Conchophyllum maximum* Karsten." Thus there seem to be regular "associations" of myrmecophytic epiphytes, in the sense plant ecologists use this term.

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[1] 1898, 'Verslag eener botanische dienstreis door de Minahasa.' (Batavia), p. 497.

M. Rumphii Beccari. Amboina. Tubers inhabited by *Pheidole megacephala* (Fabricius) (Beccari, 1884). Merrill (1917, p. 489) positively identifies with this species Rumphius.' "*Nidus germinans formicarum ruber.*"

M. alata Beccari. New Guinea. One of the tubers contained *Iridomyrmex scrutator* Smith, *Pheidole megacephala* variety, and *Crematogaster* species (Beccari, 1884).

M. Antonii Beccari. Professor Wheeler has contributed the following note with regard to this Australian species: "While I was at Kuranda, in northern Queensland, during the winter of 1914–1915, Mr. F. P. Dodd collected for me in the vicinity of the village a number of specimens of *Myrmecodia Antonii*, all of which were inhabited by colonies of *Iridomyrmex myrmecodiæ* variety *stewarti* Forel, originally described from Torres Straits. The colonies were not populous and, as the ant is small and timid, I fail to see how it can protect the plant. This ant sometimes nests about the roots and leaves of other epiphytes. At Cairns, near Kuranda, I found a colony nesting under the leaves of a *Dischidia* that were applied to the branch of a tree. In northern Queensland both *Myrmecodia* and *Hydnophytum* are called the 'ant-house' by the colonists."

M. Goramensis Beccari. Moluccas. Tubers settled by *Iridomyrmex cordata* Smith (Beccari, 1884).

M. erinacea Beccari. New Guinea. *Crematogaster* species was found in the tubers (Beccari, 1884).

M. Albertisii Beccari. New Guinea. Tubers inhabited by *Iridomyrmex cordata* Smith (Beccari, 1884).

M. Dahlii K. Schumann. Bismarck Archipelago. Dahl (1901) found the galleries of the tubers inhabited by *Iridomyrmex myrmecodiæ* subspecies *decipiens* Emery and a subspecies of *Camponotus maculatus* (Fabricius); both ants were also found nesting in other locations.

M. pentasperma K. Schumann (erroneously quoted as *M. pentagona* by Forel). Bismarck Archipelago. The tubers were inhabited by *Iridomyrmex cordata* Smith and *I. myrmecodiæ* (Emery) (Dahl, 1901).

Myrmedoma Beccari. New Guinea. Contains two species: *M. arfakiana* Beccari and *M. Naumanni* Warburg.

Myrmephytum Beccari. Malay Archipelago. With two species, *M. Selebicum* Beccari, Celebes, and *M. Beccarii* Elmer, Sibuyan (Philippines).

Hydnophytum Jack. Oriental Region. Includes thirty-five species, with swollen excavated rhizomes as in *Myrmecodia*.

H. montanum Blume (=*H. formicarum* Beccari). Malay Archipelago, northern Queensland. Miehe (1911*b*) found the tubers inhabited by *Iridomyrmex myrmecodiæ* (Emery) in Java; the walls of the galleries are in places covered with a fungus-growth similar to that of the *Myrmecodiæ*. Beccari (1884) mentions having found in the tubers *Iridomyrmex myrmecodiæ* (in Java) and *Crematogaster difformis* (in Borneo). This species was also studied by Treub (1883) and others.

H. petiolatum Beccari. New Guinea. Tubers inhabited by *Iridomyrmex cordata* Smith (Beccari, 1884).

H. amboinense Beccari. Amboina. Merrill (1917, p. 488) positively identifies with this Rumphius' "*Nidus germinans formicarum niger.*"

Squamellaria Beccari. Fiji Islands. With two species. This is related to the foregoing four genera and may possibly be myrmecophytic in a similar way; it is not known, however, whether it has tubers.

Nauclea Linnæus. Tropical Asia, Malay Archipelago, islands of the Pacific. Contains forty species.

N. lanceolata Blume. Java. The branches present swellings inhabited by ants (K. Schumann, 1891*b*, p. 57, fig. 22*B*).

N. formicaria Elmer. Mindanao, Philippines. "Nearly all the twigs of the tree were teretely swollen, 3 to 7 cm. long and 1 cm. thick. These cylindrical portions were punctured and inhabited by small black ants" (Elmer, 1911, p. 990). I have examined a specimen collected by Elmer (cotype) in the herbarium of the Arnold Arboretum of Harvard University: the cylindric swelling is situated above the middle of one of the internodes and begins and ends abruptly, being very regular and slightly flattened on the two sides corresponding to the lower leaf-pair. On the same branch the two internodes above the swelling are perfectly normal. Professor Wheeler recognized in the remains of ants found inside the domatia a species of *Crematogaster* of the subgenus *Decacrema*.

N. strigosa Korthals. Borneo and Luzon, Philippines. G. D. Haviland (1887, p. 53, Pl. II), who has examined a number of herbarium specimens, writes that in most of them "some of the branchlets have hollow swellings which have been inhabited by ants." He adds: "I suspect that this plant is the *Sarcophelus macrocephalus* of K. Schumann, of which I have not, however, been able to find any description." *S. macrocephalus* was briefly characterized by K. Schumann in 1890; its branches present swellings inhabited by ants; it was found on Samar Island near Luzon, Philippines.

Nauclea strigosa has been made the type of a distinct genus, *Myrmeconauclea*, by Merrill who says (1920, p. 376) that "a certain percentage of the branchlets always present hollow swellings, perforated on one side, which are inhabited by colonies of small ants."

N. celebica G. D. Haviland. Celebes. "The branchlets present numerous hollow swellings which have been inhabited by ants" (Haviland, 1897, p. 54).

N. cyrtopoda Miquel. Borneo, Sumatra, Java. The branches often have hollow swellings occupied by ants (Haviland, 1897, p. 57).

Uncaria Schreber (=*Ourouparia* Aublet). Tropical regions, mostly in the Old World. Contains thirty-four species.

U. africana G. Don. Tropical Africa, Madagascar, Comoros. The myrmecodomatia have been described above (p. 458).

Sarcocephalus Afzelius. Tropical regions of the Old World. There are thirteen species.

An unidentified species of *Sarcocephalus* from the Belgian Congo is myrmecophilous (see above, p. 460).

Duroia Linnæus fil. (=*Schachtia* Karsten; *Amajoua* Pœppig and Endlicher). Tropical South America. Includes ten species.

D. hirsuta (Pœppig and Endlicher).

D. petiolaris J. D. Hooker.

These two species have branches with spindle-shaped, hollow swellings which are inhabited by ants, species of *Azteca*, *Myrmelachista schumanni* Emery, and *Allomerus septemarticulatus* Mayr (K. Schumann, 1888; Emery, 1891).

D. saccifera (Martius) (=*Amajoua saccifera* Martius). Brazil. Two contiguous pouches, at the base of the leaf-blade, are often settled by ants (K. Schumann, 1888 and 1891*b*, p. 12, fig. 5*B*; Spruce, 1908).

D. dioica (Karsten) (=*Schachtia dioica* Karsten). Colombia. The original description says: "ramulis . . . ad apicem internodii inferioris elongati innovationum tumidis."[1] According to Huth (1887), Karsten did not find ants in these swellings.

Remijia de Candolle. South America. With fourteen species, only one of which is myrmecophytic.

R. physophora Bentham has two pouches, inhabited by ants, at the base of the leaf-blade (K. Schumann, 1890; Spruce, 1908).

Randia Houston. Tropics of both hemispheres, especially in the Old World. Contains 150 species.

R. Lujæ É. De Wildeman.

R. myrmecophyla É. De Wildeman.

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[1] Karsten, 1859, Linnæa, XXX, p. 157.

Both from the Belgian Congo; internodes swollen into spindle-shaped myrmecodomatia (see above, p. 465).

R. physophylla K. Schumann. Cameroon, Belgian Congo. Rudimentary pouches with a nectary, attracting ants, at the base of the leaf-blade (see above, p. 467).

Plectronia Linnæus. Tropical and subtropical parts of the Old World. Includes 200 species.

P. glabriflora (Hiern) of Tropical West Africa, *P. Laurentii* É. De Wildeman of the Belgian Congo, and some other species of Tropical Africa have swellings of the stems in which ants often nest (see above, p. 471).

Cuviera de Candolle. Tropical Africa. There are fourteen species, a number of which have swellings of the internodes inhabited by ants of the genus *Crematogaster* (see above, p. 488). Such myrmecodomatia are known with certainty for the following species:

C. longiflora Hiern. Cameroon.

C. latior Wernham. Belgian Congo.

C. Ledermannii Krause. Cameroon.

C. angolensis Hiern. Angola, Belgian Congo.

C. physinodes K. Schumann. Gaboon.

Psychotria Linnæus. A very large genus with over 400 described species and distributed throughout the tropics of the Old and New World.

P. myrmecophila Lauterbach and Schumann. New Guinea. A bush with pouch-like stipules; the margins are reflexed and the stipule itself much inflated; the cavity thus formed is divided into two by a median projecting carina; apertures are pierced through the wall and also through the inner partition. Remains of ants, together with coccids, have been found in these stipular pouches (K. Schumann and K. Lauterbach, 1901, p. 579, Pl. XXII).

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Plate XXVI

Fig. 1. Nest of a harvesting ant (*Messor* species) in the Athi Plains, British East Africa, July, 1906.

Fig. 2. Bushes of a species of *Acacia* with galls on the swollen thorns, often inhabited by ants. Athi Plains, British East Africa, July, 1906.

Fig. 3. Species of *Acacia* with galls on the thorns inhabited by ants. Near the Tana River, 25 miles below Fort Hall, British East Africa, September, 1910.

Photograph by Mr. Carl E. Akeley

1

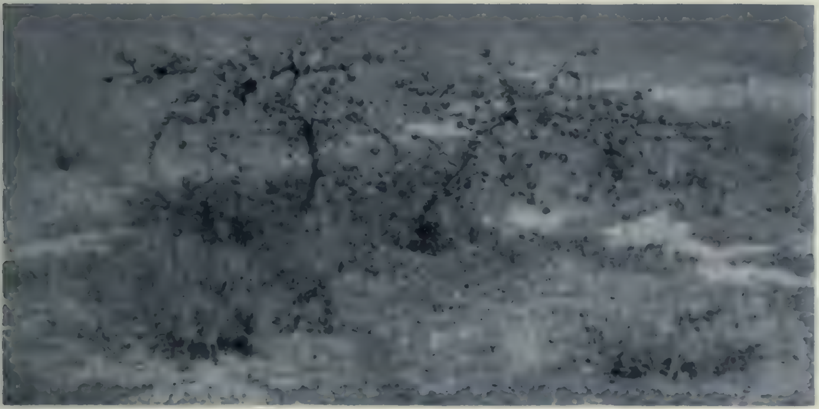

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PLATE XXVII

Fig. 1. *Scaphopetalum Thonneri* De Wildeman and Durand. Niapu, January 1, 1914. Extremity of a branch with ant inhabited pouches at the base of the leaf-blade. The five leaves still attached are seen from above; the two detached (lower part of photograph) show the under side with slit leading into the pouch; between them is a longitudinal section of one of the ascidia.

Fig. 2. *Cola Laurentii* De Wildeman. Stanleyville, March, 1915. Extremity of a branch with flowers and fruit. Many of the leaves show the pair of characteristic ant-pouches at the base of the blade.

1

2

PLATE XXVIII

Barteria fistulosa Masters

Fig. 1. Tree growing in secondary forest near the Tshopo River, Stanleyville, April, 1915. The horizontal branches and the spreading leaves are well illustrated.

Fig. 2. Two lateral branches inhabited by *Pachysima æthiops* (F. Smith). The upper one demonstrates the spreading leaves and the sudden swelling at the base of the branch; the lower one, sectioned longitudinally, shows the cavity occupied by the ants. Medje, October, 1910.

1

2

PLATE XXIX

Barteria fistulosa Masters. Tree left standing in a forest path near Medje, October, 1910. Characteristic are the horizontal branches, some of which in the upper part of the tree have lost their leaves. The branches represented in Pl. XXVIII, fig. 2 were from this specimen.

V.—THE ANATOMY OF CERTAIN PLANTS FROM THE BELGIAN CONGO, WITH SPECIAL REFERENCE TO MYRMECOPHYTISM

By Irving W. Bailey

Introduction

In examining a dried specimen of the myrmecophytic *Vitex Staudtii* Guerke collected by Lang and Chapin at Medje in the Belgian Congo, I was impressed by the close correlation between the distribution of the lateral cavities (supposed excavations) and the phyllotaxy of the plant. Through the courtesy of my colleague, Professor Wheeler, to whom the material had been sent by the collectors, I secured the opportunity of sectioning nodes and internodes of portions of the specimen and of studying their anatomical structure. So many features of unusual interest were encountered that it seemed advisable to study in detail the anatomy of other myrmecophytes from tropical Africa. All of the available material of ant-inhabited species of *Sarcocephalus*, *Barteria*, *Plectronia*, and *Cuviera* secured by Dr. Bequaert and Messrs. Lang and Chapin was very kindly turned over for my use. The myrmecodomatia of these genera proved to be fully as interesting as those of *Vitex*. Indeed, in so far as the anatomy of the host plants is concerned, the African myrmecophytes are even more remarkable than the much discussed *Acaciæ*, *Cecropiæ*, and *Myrmecodiæ* and are specially significant in any general consideration of myrmecophily.

Minute Anatomy of African Myrmecophytes

Vitex Staudtii Guerke[1]

The taxonomy and general gross morphology of this verbenaceous liana are described by Dr. Bequaert on pages 447-452. The plant exhibits a typical decussate phyllotaxy. In other words, pairs of opposite leaves alternate with each other at right angles, resulting in four vertical rows or orthostichies of leaves. As is frequently the case in plants having this type of phyllotaxy, the stems are four-sided and quadrangular, each side corresponding to one of the orthostichies of leaves. At each node there are two circular apertures which are located at approximately the same level on opposite sides of the stem and midway between the leaf-scars or points of attachment of the leaves (Fig. 88c). These orifices, which serve as exit holes for the ants, shift their position from one pair of opposite sides of the stem to the alternating pair at each succeeding internode.

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[1] The following account of the anatomy and histology of this creeper is based upon the study of material (No. 743) collected by Lang and Chapin at Medje, July, 1914.

When the stem is split open it is found to be hollow. The central cavity is continuous from internode to internode, but is considerably constricted just above each node by a thicker peripheral layer of medullary tissue (Fig. 88, *A*–*A*). In addition to the nodal apertures which communicate with the exterior, there are numerous lateral internodal cavities which perforate the xylem and end blindly just under the bast. They are arranged symmetrically, one over the other, in longitudinal rows subtending the nodal apertures (Fig. 88*l*). In other words, there is an obvious and close correlation between the distribution of the lateral cavities and the phyllotaxy of the plant.

In specimens which are inhabited by *Viticicola tessmanni* (Stitz) Wheeler, the conditions described above are characteristic of all portions of the stems and branches having fully elongated internodes. Only during the earlier stages in the differentiation of the nodes and internodes —in relatively close proximity to the growing-points or apical meristems —are they filled internally with medullary tissue and devoid of lateral cavities. The longitudinal and lateral cavities are also absent in very young plants that are not inhabited by ants. Such facts as these suggest that the central cavities and their bisymmetrically arranged lateral ramifications are excavated by the ants, which leave the supernodal constrictions or projecting rings of medullary tissue to separate the broods and prevent them from falling downward into the lower internodes.

In his field studies of *Vitex Staudtii*, Dr. Bequaert was unable to find any external evidences of preformed structures like the "prostomata" of *Cecropia*, described by Fritz Müller (1880–81), Schimper (1888) and others, which might account for the curiously symmetrical arrangement of the nodal apertures and lateral internodal cavities; nor was he able to find any clue to the functional significance of the latter. They are not used as receptacles for eggs, larvæ, or pupæ, nor do they contain coccids or other organisms. The only explanation that suggested itself was that they might be constructed for purposes of aëration. This suggestion is negatived, however, by the structure of those portions of the "bark" which cover the outer ends of the supposed lateral excavations. There are no lenticels or patches of aërenchyma suitably located, through which air might readily penetrate into the interior. On the contrary, the overlying tissues are compact and devoid of conspicuous intercellular spaces, and, in old stems, there are thick disks of impervious sclerenchyma situated just opposite the ends of the lateral cavities (Pl. XXXII, fig. 4).

Lateral Cavities

In stout, dry stems and branches of *Vitex Staudtii*, the lateral cavities appear superficially to be galleries or pits excavated in the woody portion of the "central cylinder," or stele. As is shown in Pl. XXXII, fig. 4, they perforate the xylem and end blindly on a general level with the cambium. However, a more detailed and critical study of the histology of the tissues figured in this photomicrograph indicates conclusively that the cavities are not mere tunnels in the normal xylem, since there is no fringe of chewed and broken prosenchyma such as occurs in galleries excavated by wood-boring insects. The outer two-thirds of the cavity are jacketed by the remains of a layer of very thin-walled, unlignified cells (*TPa*). In the xylem this layer rests upon heavily lignified, thick-walled parenchyma (*LXmPa*) which, in turn, merges more or less abruptly into prosenchyma (*XmPr*) (Pl. XXXII, fig. 3). That these layers were not formed subsequent to the excavation of a cavity in the prosenchyma is shown by the fact that there is no unconformity—torn or broken libriform fibers—between the parenchyma and surrounding prosenchyma.

What, then, is the mode of formation of the lateral cavities? Are they preformed structures or galleries excavated from a pre-existing core of delicate tissue? The section, illustrated in Pl. XXXIII, fig. 1, which was made from a freshly cut stem preserved in alcohol is of considerable interest in this connection. The soft tissues are *in situ* and have not contracted and collapsed as in preparations made from dried specimens. The lateral cavity does not extend to the general level of the surface of the woody cylinder, but its convex end subtends a plug of soft tissue (*CT*) which projects into the xylem. The inner portion of this intruding mass of unlignified tissue is jacketed laterally by an extension of the layer of thin-walled, unlignified cells (*TPa*) previously mentioned, which resemble in size, shape, and orientation those of the adjoining layer of heavily lignified xylem-parenchyma (*LXmPa*). Externally, the central core is constricted more or less by the phloem and cortex, into which it gradually merges. Since its outer margin is somewhat convex and its inner surface is concave, it forms a roughly dome-shaped layer of considerable thickness. Dark-colored, elongated, conducting cells, ramifying from the phloem (*Pm*), proliferate through it, and, as is shown in Pl. XXXIII, fig. 2, the thin-walled isodiametric cells which form its ground mass are arranged more or less symmetrically in radiating rows. This is particularly true of its inner portion (*NL*), where the cells are very much smaller and of more uniform size and shape (Pl. XXXIII, fig. 4). In examining the photomicrographs, it should be noted that the concave inner margin of this intruding core of delicate, unlignified tissue is irregularly serrate (Pl. XXXIII, figs. 2 and 4) and shows unmistakable evidences of having been gnawed by the ants. Small chunks of tissue have been nipped out of the surface, leaving a fringe of torn and injured cells. This suggests that the lateral cavities are not natural gaps in the woody portion of the central cylinder but are galleries excavated by the ants in peculiar cores of delicate, unlignified tissue, that are symmetrically distributed in certain radii of the stem.

The question presents itself, accordingly, as to whether these parenchymatous areas of the xylem are normal features in the anatomy of *Vitex Staudtii* or traumatic structures produced by the ants. They have the appearance of abnormalities and resemble certain complex zoöcecidia or so-called prosoplasmatic galls, with their histological differentiation into "nutritive," "mechanical," and "conducting" tissues. The similarity becomes very striking indeed when these peculiar structures are studied microchemically. The cells—septate libriform fibers and parenchyma—of the normal xylem are packed with starch (Pl. XXXIII, figs. 1 and 3) and are separated from the core of thin-walled tissue by the layer of thick-walled, heavily lignified parenchyma corresponding to a mechanical layer, which is devoid of starch, as is the thin-walled unlignified parenchyma which adjoins it. The dome-shaped, central core of soft tissue is abundantly supplied with proteins and fats, which reach their highest concentration in the cloudy protoplasts of the small, regularly arranged cells of the inner zone (Pl. XXXII, fig. 5). In stout stems the cap or disk of sclerenchyma, which is formed by the periderm and overlies the soft core of unlignified tissue (Pl. XXXII, fig. 4), corresponds to a second mechanical layer. It is evident, accordingly, that in the tissues which surround the lateral cavities there are the equivalents of a "starch layer," a "protein-fat," or "nutritive" layer, two "mechanical" layers, and a ramifying system of conducting cells. As in certain insect galls,[1] the starch and protein-fat containing tissues are separated by a layer of heavily lignified cells, and the second, mechanical or "protective" layer is situated near the exterior. However, in view of the fact that ants are not known to produce gall-heteroplasias, particularly of this highly differentiated and structurally complex type, more critical evidence is required before these structures can safely be considered to be of traumatic origin and due solely to the activity of the ants.

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[1] Compare cynipid and other prosoplasmatic zoocecidia described by Houard (1903), Küster (1903, 1911), Cosens (1912), and others.

I have already stated that the lateral cavities do not contain coccids or the larvæ of gall-making insects; this is true of young as of old, stout stems and branches. Furthermore, the tissues in question do not appear to contain bacteria or other micro-organisms. In very young, tender stems, just subsequent to the formation of the longitudinal central cavity, the flat sides of the stele, or so-called fibrovascular cylinder, are prosenchymatous and devoid of gaps or oval patches of delicate tissue, and the peripheral layer of medullary tissue is homogeneous and entire (Pl. XXXII, fig. 2). At a little later stage in the differentiation of the internodes, the lateral cavities make their appearance. Macroscopic and microscopic studies of the tissues in the interior of such internodes reveal very clearly the mode of origin of the oval lateral pits. Patches of the medullary tissue are ripped and torn away and the prosenchyma is perforated, revealing the cambium. The exposed portion of the latter divides actively, producing callus, which projects toward the interior of the stem (Pl. XXXIV, fig. 2). With further increase in the size of the stem, the cavities, which are somewhat irregular at first with jagged margins, are enlarged by the removal of additional elements of the medulla and prosenchymatous xylem and are smoothed till they finally assume their characteristic symmetrical, oval outlines (Pl. XXXII, fig. 3). These facts indicate very clearly not only that the lateral cavities are excavated by the ants, but that the peculiar tissues that surround them are abnormalities, comparable to zoöcecidia or heteroplasmatic galls.

Although the heteroplasias are relatively simple at their inception, they soon become complex and highly differentiated from the histological point of view. Thus, at first, there is merely a simple callus, which projects into a perforation in the prosenchymatous xylem. This is accompanied by more or less hypertrophy of the cells of the overlying cortex and a slight retardation in the development of the subepidermal periderm (Pl. XXXIV, fig. 2 and Pl. XXX, fig. 2). As growth proceeds, other structural abnormalities make their appearance. Owing to traumatic stimuli, the peripheral layer of meristematic cells of the cambium, adjoining the callus, ceases to form prosenchymatous xylem and lays down thick-walled, heavily lignified parenchyma next to the prosenchyma and thin-walled, unlignified tissue next to the callus. As the mass of the callus increases, extensions of the phloem proliferate through it, accelerating a flow of nutritive substances to its innermost portions. When the overlying periderm is differentiated, it remains for a time unmodified or only slightly modified in structure (Pl. XXXIII, fig. 1), but later forms a disk of very dense, heavily lignified tissue, or sclerenchymatous cap, opposite the central core of delicate cells (Pl. XXXII, fig. 4). As the woody cylinder increases in diameter, the ants continually, *i. e.*, at relatively frequent intervals, excavate the inner margin of the intruding mass of callus, for if they do not do so the lateral cavities become occluded by wound-wood. Such occluded galleries are of common occurrence, particularly in long internodes having very numerous heteroplasias and small broods.

The next question to be considered then is, why are these zoöcecidia so symmetrically arranged in obvious correlation with the decussate phyllotaxy of the plant? Pl. XXX, fig. 1 illustrates a transverse section of a young internode, cut just ABOVE a node (at the level *A–A* of Fig. 88). The four sides of the quadrilateral stem are histologically similar, with one notable exception. The vessels or principal water-conducting passageways are largely concentrated in one pair of opposite sides of the stele. A similar condition is shown in Pl. XXX, fig. 2, a transverse section cut just BELOW the node (at the level *B–B*, Fig. 88), but the vessels in this case are aggregated in the alternating pair of sides. In other words, the principal water-conducting passageways in each internode are largely confined to those sides of the stele which are to pass out to the leaves at the next (higher) node. Therefore, their orientation changes at each succeeding internode in accordance with the decussate phyllotaxy of the plant. As shown in Pl. XXX, fig. 2, the lateral cavities are excavated in the sides of the stele which are poorly supplied with vessels. Furthermore, they are located in those portions of the xylem which are devoid even of a narrow fringe of small primary tracheæ (*PT*).

Why should the ants select these radii of the stem for the construction of the lateral pits? Of course, the breaking of the conduits would certainly interfere with the normal flow of water to the leaves, and, inasmuch as in vines and lianas the area of water-conducting tissue is relatively small in proportion to the area of transpiring leaf-surface, this might affect the normal physiological processes of the plant and even lead to the drying up of the leaves. It seems probable, however, that the ants avoid the vessels because when the conduits are ruptured there is an excessive flow of water. That the cambia on the four sides of the stem are equally capable of producing the hyperplasias, is indicated by the fact that when the ants make an excavation in the wrong surface, as occasionally happens, it results in the formation of a heteroplasia which resembles those that occur so abundantly in the alternating pair of surfaces.

Exit Apertures

In stout stems the inner portions of the exit holes resemble structurally those of the lateral pits which subtend them. The prosenchymatous xylem is jacketed by thick-walled, lignified parenchyma which is covered in turn by a layer of thin-walled, unlignified tissue. The outer surface of the xylem surrounding the exit gallery, however, is depressed considerably below the general level of the woody cylinder (Pl. XXXIV, fig. 1). In this depression rests a peculiar ring of sclerenchyma (Pl. XXXIV, figs. 1 and 3) which extends to the outer surface of the stem and usually projects considerably beyond it, so that the nodal apertures have externally an embossed or crater-like profile. These rings of extremely dense, tough tissue make their appearance in young stems and undoubtedly tend to prevent the cambium and cortex from forming lateral callus which would seal the exit hole unless periodically removed by the ants.[1] Similar structures may be formed in the internodal portions of the plant whenever, as occasionally occurs, one of the lateral galleries is extended beyond the cambium, through the cortex and epidermis, to the exterior of the stem. Under these circumstances the usual sclerenchymatous disk (Pl. XXXII, fig. 4) is replaced by a projecting ring of sclerenchyma (Pl. XXXIV, fig. 1).

I have already called attention to the bisymmetrical arrangement of these nodal apertures and their obvious relation to the decussate phyllotaxy of *Vitex Staudtii*. At each node there are two exit holes excavated on opposite sides of the stem and at approximately the same level (Fig. 88). It is interesting to note in this connection that in the verbenaceous myrmecophyte, *Clerodendron fistulosum*, described and figured by Beccari (1884–86), the nodal apertures[2] are located just below the points of attachment of the leaves, in the alternating pair of surfaces of the stem. This striking contrast in the location of the exit holes in the two myrmecophytes is due apparently to differences in their nodal and internodal anatomy. In *Vitex Staudtii* two entire sides of the stem pass out into the pair of opposite leaves at the node. These sides—"leaf traces"—which are considerably narrower than the alternate pair (Pl. XXX, fig. 2) become more and more abundantly supplied with vessels in the vicinity of the node. With the passing out of the leaf-traces, leaving two large gaps in the stele, there is an abrupt transition in the remaining sides of the stele from xylem that is nearly devoid of vessels to woody tissue that is crowded with water-conducting passageways. Therefore, the most favorable situations for the location of the nodal apertures are to be found midway between the points of attachment of the leaves and just below the level where these structural transitions occur. In the stems of certain species of *Clerodendron*, on the other hand, the elements of the xylem are differentiated and distributed in such a manner that the "prostomata" subtend the bases of the leaves.

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[1] In a number of other myrmecophytes that I have studied the exits or entrances soon become blocked by callus and ultimately by wound-wood unless kept open by the ants.

[2] Schimper (1888) questions Beccari's statement that these apertures arise spontaneously and considers that they are excavated by ants.

The gaps left in the woody cylinder by the exit of leaf-traces are filled with very delicate, soft tissue. *A priori*, it would seem as if these gaps would be the most favorable places for the excavation of the exits. It should be noted, however, that if they were so utilized there would inevitably result a destruction of the axillary buds and the formation of lateral branches be prevented. In *Vitex Staudtii*, although the ants occasionally remove a portion of the tissue, I have never seen a node in which they had cut their way through to the exterior. Yet, as soon as the buds form branches, the cavities in the latter are found to communicate freely with those of the main axes. From the point of view of insect behavior, it would be extremely interesting to discover whether there are structures or substances in the buds which prevent their destruction by the ants.

Origin of the Central Cavities

Many of the earlier investigators assumed that the central chambers of various myrmecodomatia are excavated by ants. Thus, Rumphius (1750) and others considered that the anastomosing galleries in the "pseudobulbs" of *Myrmecodia* and *Hydnophytum* are constructed by ants. There is a considerable element of danger, however, in making hasty generalizations in regard to the origin of these structures. Forbes (1880), Treub (1883), and others have shown that the domatia of *Myrmecodia* and *Hydnophytum* occur normally in plants from which ants are entirely excluded. Furthermore, it is well known that plants, both herbaceous and arborescent, having hollow internodes are widely distributed in both temperate and tropical regions.

It has been stated that the stems of very young seedling plants of *Vitex Staudtii*, which are not inhabited by *Viticicola*, are filled with medullary tissue, whereas those of older plants, which are occupied by the ants, are hollow except in the vicinity of the growing points. This might be considered to indicate that the domatia are excavated by *Viticicola*. It must be admitted, however, that evidence of this character is purely circumstantial and not necessarily conclusive. Hollow internodes may be present in large, vigorous adult shoots when they are entirely absent in smaller stems, such as are frequently formed during the earlier stages in the ontogeny of the plant or under unfavorable growth conditions. Furthermore, in examining herbarium material of other representatives of this genus, I find that, although certain species possess solid stems, others normally have well-developed central cavities in their core of medullary tissue (Pl. XXXI, fig. 1). The structure of the delicate, immature internodes of ant-inhabited specimens of *Vitex Staudtii* is of interest in this connection. Pl. XXXII, fig. 1 illustrates a transverse section of such an internode cut a relatively short distance behind the terminal growing-point. The medulla is not homogeneous but consists of an oval central core of very large, thin-walled cells and a peripheral layer of denser medullary tissue, which is richly protoplasmic. As the stem increases in diameter the oval core of delicate tissue shrivels up and is trimmed away by the ants leaving the oval cavity shown in Pl. XXXII, fig. 2. From the point of view of this histological evidence, it seems probable that in *Vitex Staudtii* there is an inherent tendency towards the formation of hollow stems and branches. Whether the ants accelerate the formation of the central cavities, as has been shown by Fiebrig (1909) to be the case in *Cecropia*, can only be determined by careful field observations.

Cuviera

A number of species of the African, rubiaceous genus *Cuviera* are myrmecophytic and characterized by having elongated, spindle-shaped swellings on the branches (Figs. 99 and 100) which are inhabited by ants.[1] Two lots of these myrmecodomatia, one collected by Dr. Bequaert at Stanleyville, March 8, 1915 and the other (No. 1031) by Messrs. Lang and Chapin at Kunga near Malela, July, 1915, were sent to me for anatomical study. The former, occupied by *Crematogaster africana* subspecies *laurenti* variety *zeta* (Forel), were obtained from *Cuviera angolensis* Hiern; the latter, inhabited by *Crematogaster impressiceps* variety *frontalis* Santschi, from an unidentified species of *Cuviera*.

The myrmecodomatia of the two species are similar and differ only in certain minor morphological and histological details. Externally, those of *Cuviera angolensis* are shorter, slimmer, and of a deep olive green color, whereas the others are longer, stouter, and of a reddish green color.[2] The color differences are due largely to differences in the internal distribution of a translucent, amorphous, amber-colored substance commonly referred to as "tanniniferous" or "resiniferous," which occurs normally in many of the Rubiaceæ. As is shown in Pl. XXXV, fig. 1, there is a considerable concentration of this amber-colored substance in the subepidermal and other cortical cells of the unidentified species of *Cuviera*, which gives to the branches their reddish tinge. In *C. angolensis*, on the other hand, the cortex and bast are relatively free from it (Pl. XXXV, figs. 2 and 3; Pl. XXXVI). The structure and shape of the core of medullary tissue is not the same in the two species. In the former (Pl. XXXV, fig. 1), the cells which contain the amber-colored substance are aggregated in the center of the more deeply lobed medulla, whereas in the latter (Pl. XXXV, fig. 2) they are diffused, with a peripheral row scattered along the inner margin of the stele.

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[1] See Schumann (1891).

[2] In making these comparisons I am dealing with material preserved in alcohol

Mode of Origin of the Myrmecodomatia

As has been shown by Dr. Bequaert (Part IV, p. 490), the myrmecodomatia are not abnormalities produced by ants or gall-forming organisms. They are preformed, localized, hollow hypertrophies of the branches that become occupied by ants, or occasionally by the larvæ of certain beetles, after they have become fully differentiated. This is shown very clearly by the structure of swollen branches which have no entrance holes and are entirely devoid internally of insects or other organisms during the various stages of their "ontogeny." Pl. XXXVI, fig. 1 illustrates a transverse section of the swollen, lower portion of a young, tender internode. The cortex, stele, and medulla are already clearly outlined, but their finer histological details are still in process of differentiation. The pith is not homogeneous, as is the case in the unswollen, upper portion of the internode, but consists of a large central core of succulent pulp and a peripheral layer of denser tissue. Furthermore, it is evident that the differentiation of the so-called fibrovascular cylinder is not proceeding uniformly, since two opposite sides of the stele are considerably thicker than the intervening pair. As the lower part of the internode becomes more and more hypertrophied, the juicy delicate tissue in its interior gradually collapses and dries up; except for a fringe of thin-walled cells, filled with the amber-colored, hyaline substance, which jacket the inner margin of the peripheral layer of thick-walled medullary tissue (Pl. XXXVI, fig. 2).

Entrance Holes

Although the circular apertures, through which the ants gain access to the interior of the swollen internodes, are not so regularly arranged as in *Vitex Staudtii*, yet they are more or less symmetrically oriented in relation to the somewhat distorted—by torsion—decussate phyllotaxy of the plant, and shift their position regularly at each succeeding internode. This is determined apparently by the structure of the walls of the myrmecodomatia. As is shown in Pl. XXXV, fig. 3 and Pl. XXXVI, fig. 1, the four sides of the swollen portion of the branch are not similar either in size or in thickness. The ants almost invariably make their primary excavations in the thin side of the stem which has the widest surface. Therefore, since the position of this surface is closely related to the decussate phyllotaxy, the orientation of the entrance holes shows a similar correlation.

The structure of the tissues surrounding the entrance holes indicates that the ants make the perforations subsequent to, or during the later stages of, the formation of the central cavities, and before the cambium has formed numerous prosenchymatous elements in the thinner sides of the swollen internodes.

Lateral Excavations and Heteroplasias

As shown in Figs. 99*b* and 100*a-b*, the myrmecodomatia of *Cuviera* are characterized internally by a number of elongated or oval pits which are located in the thinner sides of the branch. These depressions, which are arranged in one or two longitudinal rows, or more irregularly scattered, are commonly occupied by coccids of different ages and sizes.[1] In certain myrmecodomatia each pit contains a coccid which more or less completely fills it, whereas in others only two or three of the pits are so occupied, or the coccids may be entirely absent.

When studied microscopically, these pits are found to contain growths of thin-walled callus (Pl. XXXV, fig. 3; Pl. XXXVII, fig. 2) which recall the dome-shaped callus formations that occur in the lateral galleries of *Vitex Staudtii*. As in the latter, the cells are arranged in radiating rows but, instead of containing cloudy, opaque protoplasts, are filled with the golden yellow, or reddish brown, hyaline substance which occurs normally in certain cells of the cortex, phloem, xylem, and medulla. In addition, it may be noted that the prosenchymatous margin of the xylem is not jacketed by two clearly defined layers of parenchyma, and there is no elaborate, ramifying system of conducting cells (Pl. XXXVII, fig. 2).

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[1] The coccids in *Cuviera angolensis* have been identified by Newstead as *Pseudococcus citri* variety *congoensis* Newstead.

The structure of these heteroplasias, as well as their entire absence in swellings which have not been occupied by insects, indicates that they are abnormalities produced by traumatic stimuli. The question presents itself, accordingly, are they due to the activities of the ants or the coccids? That they serve as food-reservoirs for the coccids is shown by the fact that the sucking mouth-parts of the latter are embedded in the callus. The torn and chewed inner margin of the heteroplasias (Pl. XXXVII, fig. 1) suggests, however, that these layers are also fed upon by the ants. Furthermore, the pits or depressions originate as excavations in the thinner walls of the domatia and not by the collapse of soft tissue or the retardation of the growth of tissues underlying the coccids. Since the cells of the peripheral layer of medullary tissue and the first-formed elements of the prosenchymatous xylem are relatively tough and thick-walled at the time when the excavations are started, they must have been made by insects with strong mandibles and not by the delicate sucking mouth-parts of the coccids. In this connection, it should be emphasized in passing that all of the myrmecodomatia examined contained the lateral pits and heteroplasias regardless of the presence or absence of the coccids. As in *Vitex Staudtii*, the ants evidently cut through to the cambium and induce the formation of a nutritive callus before the stele becomes considerably thickened.

"Fungus Gardens"

As has been stated previously, the internal cavities of hypertrophied branches which have no entrance apertures are entirely devoid of parasitic or saprophytic organisms. The walls of the myrmecodomatia, on the contrary, form the substratum for a more or less luxuriant growth of fungi. In recently occupied cavities, which are jacketed by a layer of cells containing the amber-colored substance, scattered aërial hyphæ project into the interior from all sides (Pl. XXXVII, fig. 3). In the case of the domatia of the unidentified species of *Cuviera*, which contain numerous ants, the hyphæ and amber-colored substratum have been more or less cleanly gnawed away except at the two ends of the spindle-shaped cavity (Pl. XXXVIII, fig. 1) where there are dense growths of delicate, white hyphæ, resembling "ambrosia." As shown in Pl. XXXVIII, fig. 4, there is a considerable layer of detritus between this crop of aërial hyphæ and the basic substratum of medullary tissue.

When analyzed microscopically, the detritus is found to consist largely of the more or less disintegrated castings from the infrabuccal chambers of the ants and to contain numerous nematodes (Pl. XXXVIII, fig. 3). The hyphæ radiate through this layer in all directions and penetrate into the underlying medullary cells. In the myrmecodomatia of *C. angolensis*, which contain relatively few ants, there is a similar terminal concentration of hyphæ, but it is less conspicuous, owing to the fact that the lateral walls of the cavities have been less thoroughly scarified.

Plectronia species *A*

Among the specimens turned over to me for anatomical study were some myrmecodomatia, preserved in alcohol, which were collected by Dr. Bequaert near Stanleyville, March 6, 1915. They were inhabited by *Engramma kohli* Forel and were collected from an unnamed species of the rubiaceous genus *Plectronia*, referred to as species *A* in Part IV (p. 474).

The myrmecodomatia of this plant resemble those of *Cuviera* in that they are preformed, localized, hollow swellings of the branches which are occupied by ants (Fig. 96). Sections of the normal and abnormal portions of the branches are illustrated by photomicrographs on Pl. XXXIX. As in the case of *Cuviera angolensis* (Pl. XXXV, figs. 2 and 3), the pith in the former regions is homogeneous, whereas in the latter portions it is heterogeneous, consisting of a succulent central pulp, which collapses, and a peripheral layer of denser medullary tissue. Two opposite sides of the swollen branch are considerably thinner than the alternate pair, and the differentiation of the cambium and fibrovascular tissues is retarded in them. The ants pierce one of these thin walls and scarify its inner surface, as well as that of the opposite side. From these injured surfaces and from the margins of the irregularly shaped apertures heteroplasias originate, which superficially resemble those that occur in *Cecropia* under somewhat similar circumstances (Pl. XL, fig. 1). As shown in Pl. XL, fig. 2, the heteroplasias consist of two distinct tissues—a central core of thick-walled, heavily pitted parenchyma, that is packed with starch, as is the parenchyma of the normal and abnormal xylem; and an outer layer of thin-walled, isodiametric cells, which are filled with an amber-colored, hyaline substance such as occurs in the heteroplasias of *Cuviera*. The torn and chewed inner margin of this layer indicates that it is eaten by the ants. Furthermore, in a number of the myrmecodomatia small coccids were found attached to this callus-tissue by their proboscides.

In addition to the myrmecophytes that have been described in the preceding pages, and of which there was an abundance of well-preserved material suitable for anatomical study, there are four others of which unfortunately only fragmentary material is available. However, in view of the fact that more abundant and better preserved specimens cannot be obtained in the immediate future, it seems desirable to call attention to certain features of these plants, upon which some light is thrown by the evidence at hand.

Plectronia Laurentii De Wildeman

The myrmecodomatia of this interesting plant have been described and figured by De Wildeman (1905-07) after É. Laurent's notes and by Kohl (1909). Additional notes upon their gross morphology are given by Dr. Bequaert (p. 471; Fig. 95*a* and *b*). My own observations are based upon the study of two dried myrmecodomatia, collected by Dr. Bequaert near Stanleyville, March 6, 1915, which contain coccids and *Crematogaster africana* subspecies *laurenti* variety *zeta* (Forel).

The myrmecodomatia are preformed, more or less pronounced hollow swellings of the stems and branches, of the two general types figured on Pl. XLI. The internal cavities originate apparently by the falling away of the central succulent portion of the heterogeneous medulla. As in the case of the previously described myrmecophytic plants, two opposite sides of the domatia differ in thickness and in histological differentiation from the alternating pair. Entrance apertures and longitudinally arranged lateral excavations, which frequently coalesce to form grooves or trenches, are located in these walls and change their position at each succeeding internode in correlation with the decussate phyllotaxy of the plant. The pits contain heteroplasias which resemble those of *Vitex Staudtii* in that their nutritive layers do not contain an amber-colored substance. Many of the coccids are attached to this tissue by their sucking mouth-parts. The zoöcecidia resemble those of *Vitex Staudtii* in the frequent occurrence of an outer cap of sclerenchyma, which is formed by a periderm opposite the delicate core of callus (Pl. XLI, fig. 2). The less quadrangular of the two myrmecodomatia examined by me contains "fungus gardens" at the two ends of its spindle-shaped inner cavity, which closely resemble those that occur in *Cuviera*. However, in these domatia the substratum of thick-walled medullary tissue, upon which the gardens rest, does not contain an amber-colored substance. The parenchyma of the woody cylinder and the cells of the medulla, except those in the vicinity of the central cavity, are densely packed with starch.

Barteria fistulosa Masters and **B. Dewevrei** De Wildeman and Durand

The taxonomy and general gross morphology of these flacourtiaceous myrmecophytes have been discussed in detail by Schumann (1891), De Wildeman (1905–07), and by Dr. Bequaert on pp. 432–441. *B. fistulosa* is characterized by numerous hypertrophied, hollow, deciduous branches which are frequently more or less fasciated in appearance (Fig. 86), *B. Dewevrei* by hollow stems and branches of normal dimensions (Fig. 87).

The material that I have studied consists of several myrmecodomatia of *B. fistulosa* (No. 933), collected by Messrs. Lang and Chapin near Stanleyville, larvæ of *Pachysima æthiops* (F. Smith) (No. 747), removed from the myrmecodomatia of *B. fistulosa* at Medje, and a section of a hollow twig (No. 175) of *B. Dewevrei*, secured by Dr. Bequaert near Leopoldville. The myrmecodomatia of *B. fistulosa* contained *Crematogaster buchneri* subspecies *biimpressa* (Mayr) and *Pseudococcus citri* variety *congoënsis* Newstead; the hollow twig of *B. Dewevrei*, *Crematogaster* (*Atopogyne*) *africana* variety *schumanni* (Mayr), and *Lecanium* (*Saissetia*) *barteriæ* Newstead.

Pl. XLII, fig. 1 illustrates a transverse section of the normal, unswollen, basal portion of a deciduous branch of *B. fistulosa*. The pith is homogeneous and consists of compact, relatively thin-walled parenchyma. The fibrovascular cylinder or stele is well developed and of normal structure. In the hypertrophied portion of the branch or myrmecodomatium, on the contrary, the medulla is heterogeneous and the stele is feebly developed and broken up into separate strands or bundles (Pl. XLII, fig. 2). A core of succulent pulp has evidently collapsed except for a layer of thin-walled cells which jacket the cavity and are filled with an amber-colored substance such as occurs in *Cuviera* (Pl. XXXVI, fig. 2). The amber-colored substance also occurs in cells which are scattered through the peripheral layer of denser medullary tissue, and in the subepidermal cells of the cortex. É. Laurent (1903–04; see De Wildeman, 1905–07) and Kohl (1909) found lateral pits or depressions in the walls of the myrmecodomatia of *Barteria fistulosa*, many of which were occupied by coccids. These structures are not present in the myrmecodomatia that I have sectioned and the coccids are attached to various portions of the walls of the domatia by their proboscides. It should be noted, however, in this connection, that my material consists entirely of young, succulent branches in which processes of secondary growth are still in their incipient stages. The depressions are probably excavated in older or more woody myrmecodomatia.

A transverse section of the branch of *B. Dewevrei* (Pl. XLIII, fig. 1) resembles a similar section of the normal, unswollen portion of a deciduous branch of *B. fistulosa* (Pl. XLII, fig. 1). It differs from it, however, in two important features. The pith is heterogeneous and the internal cavity, which serves as the domatium of the ants, is jacketed by a layer of thick-walled, medullary parenchyma containing an amber-colored, hyaline substance. Furthermore, one side of the myrmecodomatium is much thinner than the others and is nearly devoid of vessels. The entrance apertures are commonly located in this wall, as are rows of depressions or oval pits (Fig. 87*d*). The latter and the heteroplasias which partially fill them (Pl. XLIV, fig. 2) recall those that occur in *Cuviera* (Pl. XXXVII, fig. 2). The large, thin-walled cells of the callus are filled with an amber-colored, hyaline substance, which occurs normally in many of the parenchymatous cells of the medulla and stele. The coccids evidently feed on the substances in these callus-formations, for their sucking mouth-parts are embedded in them. That the lateral pits are excavations made by the ants and not depressions made by the collapse of delicate cells underlying the coccids is indicated by the structure of the tissues upon the margins of the pits.

Sarcocephalus species

Among the myrmecophytes described by Dr. Bequaert is an interesting species of the rubiaceous genus *Sarcocephalus* (p. 460; Fig. 92). Unfortunately, the only available structural material of this plant consists of a dried section of a single myrmecodomatium (No. 161) which was collected at Masongo between Walikale and Lubutu. It was inhabited by *Crematogaster* (*Atopogyne*) *africana* subspecies *winkleri* variety *fickendeyi* (Forel) and coccids, which are identified by Newstead as *Pseudococcus crassipes* Newstead.

As shown in Pl. XLIII, fig. 2, this myrmecodomatium differs from the others that have been described in having four thin sides which alternate with four thick sides. Longitudinal rows of pits or grooves, which are more or less completed filled by callus-growths, are situated in these thinner walls. Numerous coccids are attached to these heteroplasias, so that when one looks through the hollow twig there are four rows of these insects hanging from the four corners of the quadrangular cavity. The heteroplasias resemble those of *Vitex Staudtii* and *Plectronia Laurentii*, since their cells do not contain a golden or reddish brown, hyaline substance; nor is the central cavity jacketed by a layer of cells which are filled with this material. The pith is heterogeneous and apparently once contained a central core of succulent pulp, which has collapsed and has been removed by the ants.

SALIENT FEATURES OF AFRICAN MYRMECOPHYTES

Although these African myrmecophytes belong to three distinct orders (Parietales, Tubifloræ, and Rubiales) and to different growth forms (trees, shrubs, and lianas) they are fundamentally similar from the anatomical and histological points of view. In all, there is apparently an inherent tendency towards the formation of a heterogeneous pith, the central succulent portion of which collapses and dries up leaving an internal chamber or cavity. They are all characterized by similar peculiarities in the differentiation of their fibrovascular cylinders, which are more or less closely correlated with phyllotaxy. Certain sides or radii of the stele tend to be thinner, to contain fewer vessels, and to differentiate later than others. In *Cuviera*, *Plectronia*, *Sarcocephalus*, and *Barteria fistulosa*, the internal cavities and peculiarities in the differentiation of the medullary and fibrovascular tissues tend to be localized in certain shoots, or certain portions of the stems and branches, and are concomitants of more or less pronounced hypertrophies of these organs. In *Vitex Staudtii* and *Barteria Dewevrei*, on the other hand, in which these conditions are more generalized, there are no external indications of swellings or abnormal enlargements of the stem and branches.

All of these myrmecophytes differ from previously described extra-African myrmecophytic plants in the occurrence, within their myrmecodomatia, of excavations that contain peculiar callus-heteroplasias.[1] These traumatic structures, which are situated, like the entrance and exit apertures, in the thinner or evascularized sides of the myrmecodomatia, are arranged more or less symmetrically in relation to the phyllotaxy of the plants, and are formed by the young cambium and cortex when these tissues are exposed by the removal of the underlying cells of the medulla and xylem. Another unique feature of this group of myrmecophytes is the occurrence in the *Cuvieræ* and *Plectronia Laurentii* of "fungus gardens." Furthermore, with the exception of *Vitex Staudtii*, all of the African myrmecophytes are characterized by containing more or less numerous coccids.

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[1] Other myrmecophytes, upon further and more critical study, may be found to contain similar structures. The "stomatomes" of *Cecropia*, described and figured by Fritz Muller (1880–81) and H. von Ihering (1907), although not located in pit-like excavations, resemble to a certain extent the heteroplasias of the unidentified species of *Plectronia*.

The myrmecodomatia of the *Cuvieræ*, *Barteriæ*, and certain of the *Plectroniæ* resemble each other in being jacketed internally by layers of cells which are filled with an amber-colored substance. The large, thin-walled cells of the heteroplasias in these myrmecophytes are also characterized by being filled with this substance. The heteroplasias in *Vitex Staudtii*, *Plectronia Laurentii*, and the species of *Sarcocephalus*, on the contrary, are devoid of this hyaline substance.

FOOD OF TWIG-INHABITING ANTS

As is shown in the appended bibliography, a considerable number of investigators have devoted more or less attention to the study of myrmecophytism but, in spite of the significance attached to the supposed symbiotic relation between plants and ants, there is comparatively little reliable information concerning the feeding habits of the latter and the extent to which they are dependent upon the former for food. It is true that one finds in the literature many conclusions in regard to the general feeding habits of the ants, but these are frequently mere assumptions and are not supported by conclusive evidence. Even in the case of the much discussed "Beltian and Müllerian food-bodies" and extrafloral nectaries, although it has been definitely established that the former are collected and the latter frequently visited by the ants, there are no critical and detailed field observations or carefully planned experimental investigations which reveal the exact nutritional significance of these structures and the rôle that they play in the feeding of larvæ, queens, and various castes of workers.

Many writers assume that, because a tissue which contains carbohydrates or other possible nutrient substances, is excavated or gnawed by ants, it serves as an important reservoir of food for these insects. Thus, a number of investigators have concluded that the ants feed upon the fresh, succulent, or more or less collapsed and dried, medullary tissue of various myrmecophytes. For example, Belt (1874) states that in the "bull's-horn" *Acaciæ*, "the thorns, when first developed, are soft and filled with a sweetish pulp substance; so that the ant, when it makes an entrance into them, finds its new house full of food." Similarly, Fiebrig (1909) and H. von Ihering (1907) assume that in *Cecropia* the juicy pith of young internodes forms an important item of food in the diet of the *Aztecæ*. It should be noted, however, that in the absence of reliable collateral evidence, the mere fact that the medullary tissue is excavated or gnawed by the ants does not indicate necessarily that it is actually eaten by them, since it may be removed solely for the purpose of cleaning or enlarging the domatia. Thus, Fiebrig (1909) records having seen *Aztecæ* in young internodes of *Cecropia*, busily engaged in excavating the medulla and casting the fragments out of the domatia through the subnodal apertures.

There is a similar uncertainty as to whether the more or less "pure cultures" of fungi, that grow upon the walls of ant nests, actually are fungus gardens, or are mats of weeds which are periodically trimmed away by the ants. Emery (1899), Lagerheim (1900), Ferdinandsen and Winge (1908), Farquharson (1914), J. S. B. Elliott (1915), Donisthorpe (1915), and others assume that various Formicidæ, other than the Attini, are fungivorous. These investigators base their conclusions upon one or more of the following lines of evidence: (1) the association of a particular fungus with a particular species of ant; (2) the occurrence of the fungus in "pure cultures"; (3) the cropping of aërial and other hyphæ by the ants; and (4) analogies with the remarkable fungus-growing and fungus-feeding habits of the attine ants. It must be admitted, however, that evidence of this character is not at all conclusive. Thus, the cropping of mycelia does not prove that a fungus is eaten by an insect. Miehe (1911) found localized, luxuriant growths of certain fungi in the pseudobulbs of *Myrmecodia* and *Hydnophytum*, but concluded that the hyphæ were cropped by the ants merely to prevent them from occluding or obstructing the galleries. The occurrence, in ant nests, of more or less pure cultures of fungi does not indicate necessarily that the mycelium is actually cultivated and eaten by the insects, since, as suggested by Perkins (1914), the mats of hyphæ may be purely adventitious. Furthermore, there is much uncertainty in reasoning from analogy with the highly specialized, phytophagous Attini that cosmopolitan, more or less omnivorous representatives of the Formicidæ are fungus-farmers.

A number of investigators assume that the coccids, which occur in so many myrmecophytes, are introduced into the myrmecodomatia by the ants and tended by them as "milch cows." For example, Belt (1874) states that in *Cecropia* the *Aztecæ* "do not obtain their food directly from the tree, but keep brown scale insects (Coccidæ)—which suck the juices from the tree and secrete a honey-like fluid that exudes from a pore on the back and is lapped up by the ants." Ule (1906) notes that most myrmecophytes contain coccids and assumes that they are brought into the domatia by the ants. É. Laurent (1903–04; see De Wildeman, 1905–07) and Kohl (1909) reach similar conclusions in regard to the coccids in *Barteria fistulosa*, and the latter infers that "im

Inneren ihrer Wohnungen geben sich die Ameisen fleissig mit der Schildläusezucht ab, in deren Exkrementen ihre hauptsächlichste Nahrung besteht." Fiebrig (1909), on the contrary, believes that the coccids in *Cecropia* "in keinem direkten Verhältnis zu diesen Ameisen stehen," and Dr. Bequaert (Part IV, p. 436) is of the opinion that the coccids find their way into the myrmecodomatia of their own accord, just as they do into other cavities (normal and abnormal) that are not inhabited by ants.

It is difficult to observe the normal activities of ants in myrmecophytes, even when living plants and insects are available. Therefore, they must be studied in artificial nests or by indirect methods. Valuable clues in regard to the feeding habits of other animals have been obtained by analyses of feces or the contents of alimentary tracts. Unfortunately, ants (imagines) take only fluids or semifluids into their crops and stomachs. They do not masticate their food with their mandibles or maxillæ. The act of feeding consists in lapping or rasping nutrient substances—which previously may have been dismembered or cut into fragments of suitable sizes by means of the mandibles—with the roughened surface of the protrusible tongue.

Meinert (1860) discovered that ants, like the social wasps,[1] have a curious "mouth sac" which he considered to be a crop or "social stomach." Although Meinert's conclusions were severely criticised by Adlerz (1886), the latter was unable to determine the true function of this infrabuccal chamber. In fact, Janet (1895, 1899) is the only student of ants who has studied the function of the infrabuccal sac with any degree of care. He demonstrated, by feeding experiments and by dusting ants with various powders, that the sac acts as a receptacle for detritus—which the imagines remove by means of their toilet organs from their own bodies, from their progeny, and from their companions—and food-residues. The latter substances may be of two distinct types: (1) coarse fragments of animal or plant tissues, which adhere to the surfaces of the ant during the process of cutting up or dismembering the food and subsequently are swept into the sac; and (2) finely divided solids rasped off by the tongue and segregated from the fluid or semi-fluid substances that pass into the crop.

The material that accumulates in the infrabuccal cavity in the form of a peculiarly moulded pellet, "corpuscule enroulé" of Janet, is finally cast out as a useless residuum or fed to a larva (Pseudomyrminæ).

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[1] Previously investigated by Brants (1841).

Although it was by means of these infrabuccal pellets that H. von Ihering (1898) and Huber (1905) were able to throw so much light upon the origin of fungus gardens during the founding of new colonies of attine ants, I have not succeeded in finding a single investigator who has analyzed an extensive series of them in searching for clues concerning the feeding habits of ants.

The strongly hypocephalic larvæ of *Viticicola* and *Pachysima* are fed with pellets voided from the infrabuccal pockets of the workers. The pellets are inserted into a curious depression or pouch (trophothylax) which is located on the ventral surface of the larva close to its head. Owing to their relatively large size and dark color, these pellets are quite conspicuous and easily obtained from larvæ preserved in alcohol. Fortunately, I have been able to secure a large number of them and to compare them with pellets dissected from the heads of imagines. I have also dissected numerous workers of *Crematogaster africana* subspecies *laurenti* variety *zeta*, *C. impressiceps* variety *frontalis*, *C. buchneri* subspecies *biimpressa*, *C.* (*Atopogyne*) *africana* variety *schumanni*, and other ants which inhabit myrmecophytes, and have analyzed the contents of their infrabuccal pockets.

Food of *Viticicola tessmanni*

In his field studies of *Vitex Staudtii*, Dr. Bequaert was unable to secure any clue in regard to the chief sources of food of the ants, *Viticicola*, which are "obligatory" inhabitants of this myrmecophyte. The plants grow in wet, swampy regions and are not provided with food-bodies or extrafloral nectaries. Unless disturbed, the ants are not found running over the vegetation. They appear to remain, at least during the daytime, in the myrmecodomatia and, as shown by my colleague, Dr. Wheeler, (p. 108), seem to be structurally modified for their life in the dark, tube-like domatia of *Vitex Staudtii*. Their eyes are somewhat rudimentary for the group to which they belong and their body color is light yellowish brown, an unusual color in species of *Tetraponera*, to which *V. tessmanni* was originally referred.

I have shown at the beginning of this paper that certain of the tissues in the myrmecodomatia of *Vitex Staudtii* are abundantly supplied with nutrient substances. The cells of the outer portion of the peripheral layer of medullary tissue in young twigs are filled with starch, and the elements (parenchyma and libriform fibers) of the xylem are densely packed with grains of this carbohydrate. The "nutritive layer" of the gall-like heteroplasias, on the other hand, is rich in nitrogenous substances and fats. The ants gnaw this protein-fat layer, but, although they clean and smooth the interior of the domatia by removing more or less of the pith, they do not appear to cut through to the starch-containing cells, except at an early stage in the formation of the heteroplasias.

That the latter structures provide the principal food of *Viticicola tessmanni* is suggested by the following facts.

1. Field observations have failed to reveal an external food supply.
2. The pellets do not contain food from an outside source.
3. The myrmecodomatia do not contain coccids.
4. The starch-containing tissues are not excavated extensively by the ants.
5. The heteroplasias are traumatic structures produced by the ants.
6. They resemble gall-heteroplasias and have a protein-fat layer which is gnawed by the ants.
7. The pellets in the larval trophothylaces are composed of fragments of this tissue (Pl. XLV, fig. 1) and bits of ant larvæ or triturated eggs (Pl. XLV, fig. 3).

Pellets of *Pachysima*

The pellets in the larval trophothylaces of *Pachysima æthiops* and *P. latifrons* are composed of substances obtained both from within and without the myrmecodomatia. Almost every pellet contains either a whole coccid larva (Pl. XLV, fig. 2), or one or more chunks of an adult coccid (Pl. XLIV, fig. 3). In addition, they have a relatively large admixture of fragments of medullary tissue, containing the amber-colored substance (Pl. XLV, fig. 6); aerial hyphæ from the walls of the domatia (Pl. XLV, fig. 5); mites; nematodes; unicellular hairs of *Barteria fistulosa;* dirt; and numerous spores of many different types (Pl. XLIV, fig. 1; Pl. XLV, fig. 4). Occasionally, they contain bits of extraneous plant tissues, pollen, fragments of malaxated insects, etc.

Pellets dissected from the heads of imagines contain a similar assortment of substances, but usually in somewhat different proportions. In other words, they have a smaller admixture of animal tissue. This is due, in all probability, to the fact that the worker nurses add fragments of coccids to their pellets before feeding them to the larvæ.

Although the larvæ undoubtedly feed upon the fragments of coccids, it is difficult to determine how much of the miscellaneous material is actually eaten by them. The larval stomach contains a structureless mush, so that analyses of the contents of this organ are of little significance in this connection. There is a similar difficulty in distinguishing between detritus and food residues in the infrabuccal chambers of the imagines. The fragments of malaxated insects are food residues, but the aërial hyphæ and fragments of medullary tissue may be vegetable débris, which adhered to the surfaces of the imagines during the process of cleaning and enlarging the domatia.

Pellets of *Crematogasters*

The infrabuccal sacs of the *Crematogasters* which inhabit the *Cuvieræ* and *Plectronia Laurentii* also contain substances both from within and without the domatia. Although many of the pellets have an admixture of malaxated insects, they do not contain fragments of the coccids which inhabit the myrmecophytes. Not infrequently, the pellets are composed entirely of bits of the ambrosia-like mycelia, or fragments of parenchyma which are packed with this fungus. Most of the pellets, as in the case of *Pachysima*, contain malaxated medullary tissue, and dirt, pollen, hairs, spores, and other extraneous substances.

The infrabuccal sacs of the *Crematogasters* which inhabit the *Barteriæ* and *Sarcocephalus* are more or less completely filled with the same general assortment of substances which occur in the infrabuccal pellets of *Crematogaster africana* subspecies *laurenti* variety *zeta* and *C. impressiceps* variety *frontalis*; except that the bits of ambrosia-like mycelia are replaced by fragments of chromogenic, aërial hyphæ which grow within the ant-inhabited cavities of these myrmecophytes.

Nutritive Significance of the Callus-heteroplasias

The problem of determining the exact nutritional significance of the callus-heteroplasias in the *Cuvieræ*, *Plectroniæ*, *Barteriæ*, and *Sarcocephalus* is complicated by the presence of coccids which feed upon these tissues. In other words, the question arises as to whether these structures are induced by the ants primarily for their own consumption or for feeding the coccids. Histological evidence indicates that the nutritive layer is gnawed and rasped by the ants, and fragments of this tissue occur in the pellets of the *Crematogasters*, but these facts in themselves do not afford a solution of the difficulty. Nor does the absence of coccids in certain of the myrmecodomatia which contain callus-heteroplasias prove that the chief function of these traumatic tissues is not the provision of food-reservoirs for Coccidæ.

Relations Between Ants and Coccids

The well known aphid- and coccid-tending habits of the Crematogastrini suggest that the coccids are introduced into the myrmecophytes by the *Crematogasters* and carefully tended by them as "milch cows." That the *Crematogasters* actually devote considerable attention to the coccids is indicated by the following observation of Kohl (1909):

> Nicht selten fand ich Cocciden-Kolonien auch ausserhalb der Höhlungen, so auf *Plectronia Laurentii*, wo sie sich in einem Gehäuse befinden, das von den Ameisen aus fein zerkleinerten pflanzlichen Bestandteilen hergestellt wird, nachdem letztere mittels einer von ihnen ausgeschiedenen klebrigen Flüssigkeit verkittet wurden. Diese Schildläusekammern standen vielfach mit den innern Nisträumen durch eine oder mehrere Öffnungen in Verbindung.

It seems probable, however, that the large colonies of coccids in *Barteria fistulosa* may be purely adventitious. The Pseudomyrminæ are not known to tend Aphididæ, Coccidæ, Membracidæ, Fulgoridæ, or Psyllidæ, and, as I have indicated on preceding pages, the *Pachysima* imagines actually carve up the coccids and feed them to their larvæ.

Nutritive Value of Medullary Tissue

The ants scarify the walls of the myrmecodomatia of the *Cuvieræ*, *Barteriæ*, *Plectroniæ* and *Sarcocephalus*, excavating the remains of the succulent, inner portions of the pith and removing more or less of the thick-walled medullary tissue. Although fragments of these tissues occur abundantly in the infrabuccal pellets of the imagines, there is, unfortunately, no conclusive evidence to indicate whether the ants actually feed upon them, or remove them merely for the purpose of cleaning and enlarging the domatia; in other words, whether the fragments in the infrabuccal sacs are food residues or detritus.

Nutritive Value of Fungi

All of the ant-inhabited plants (species of *Acacia*, *Triplaris*, *Cecropia*, *Nauclea*, *Enterolobium*, *Myrmecodia*, and *Hydnophytum*, as well as *Cuviera*, *Vitex*, *Plectronia*, *Barteria*, and *Sarcocephalus*) of which I have succeeded in obtaining suitable material have a more or less luxuriant growth of fungi upon the inner walls of their myrmecodomatia. These fungi are cropped by the ants and fragments of them are taken into the infrabuccal cavities of the imagines. However, as I have shown elsewhere (Bailey, 1920), there is no reliable evidence to indicate that these fungi are cultivated and fed upon by the ants, and are not purely adventitious and merely cropped in order to prevent them from obstructing the domatia and interfering with the broods.

Ants and Nematodes

I have shown that the infrabuccal pellets of *Pachysima* and the accumulations of detritus of *Crematogaster impressiceps* variety *frontalis* contain numerous nematodes (Pl. XXXVIII, fig. 3). Janet (1893) has pointed out that certain nematodes pass their larval stages in the pharyngeal glands of *Formica rufa* Linnæus, *Lasius flavus* (Fabricius), etc., and that sexed individuals occur in the detritus of the ant colonies. In the case of *Pachysima æthiops*, the nematodes evidently work their way into the infrabuccal sac and subsequently are transferred to the larval trophothylaces or are cast out in voided pellets.

Amber-colored Substance

I have called attention to the peculiar amber-colored substance in the normal and abnormal tissues of the *Cuvieræ*, *Barteriæ*, and certain of the *Plectroniæ*, which serves not only as an excellent "culture-medium" for fungi, but is fed upon by coccids and ants. When seen *en masse*, it is dark-colored and opaque, but in freshly-cut, thin, microscopic preparations is a translucent or hyaline, bright-golden-yellow, amorphous substance. It gradually darkens, if sections are left in alcohol or water, turning a reddish brown. The substance shrinks in drying and swells very considerably when remoistened with alcohol or water, but is insoluble in these liquids and also in ether, chloroform, benzol, carbon bisulphide, acetic, hydrochloric, and sulphuric acids, and cuprammonia. It dissolves readily, however, in dilute solutions of caustic soda, caustic potash, and nitric acid. It does not give a red color-reaction in Sudan III, alcanna, corallin, or hot or cold phloroglucin and hydrochloric acid, but takes on a reddish tinge in Hanstein's aniline and in hydrochloric acid. It turns dark in iron salts and stains readily in aniline-blue. In iodine and cold Millon's reagent, it takes on a dirty greenish color, but, when heated in the latter reagent, turns a dark brick-red. It retains its original color in hot concentrated nitric acid, but turns a darker yellow or orange brown on moistening with strong ammonia.[1]

I suspect that the substance is a complex mixture, containing proteins and carbohydrates but, in the absence of abundant material and an extensive chemical investigation, I have not been able to secure any reliable clue in regard to its composition.

Of course, it should be kept in mind that the material which I have studied consists entirely of dried specimens and of myrmecodomatia preserved in 70%-90% alcohol. Therefore, the substance in question may have been considerably modified (by phenomena of coagulation, oxidation, etc.) and may have existed in a more fluid phase in living plants. If it has not undergone solidification, the coccids must secrete substances which act upon it in order to render it sufficiently fluid to pass through their sucking mouth-parts.

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[1] When the substance has turned dark reddish brown, by standing in water or alcohol or by drying in air, the original bright-golden-yellow color is restored by treatment with nitric acid.

Similar amber-colored substances occur in a number of other myrmecophytes, particularly in rubiaceous plants. The cells of the peripheral layer of medullary tissue in the myrmecodomatia of certain *Cecropiæ* are filled with a translucent amorphous material[1] whose microchemical reactions parallel those that have been outlined above.

The exact role which these substances play in the nutrition of ants, and of the coccids and fungi which are frequently associated with them, deserves to be carefully investigated.

THEORIES OF MYRMECOPHILY AND MYRMECOPHYTISM

Hypothesis of Richard Spruce

During the last sixty years there has been considerable speculation concerning the significance of myrmecophytism. In his explorations of the Amazonian and Andean regions of South America (1849–1864) Richard Spruce encountered many plants having peculiar structural modifications, foliar sacs, hollow fistulose stems, etc., which were occupied by ants. Upon returning to England, Spruce prepared a paper[2] in which he endeavored to account for the origin of these remarkable myrmecophytes. This paper was read before the Linnæan Society on April 15, 1869, but unfortunately did not appear in print until 1908, owing to the fact that the Council of the Society would not authorize its publication unless Spruce made certain fundamental changes in the text. This Spruce refused to do.

The kernel of Spruce's hypothesis is contained in the following paragraph:

> I have reason to believe that all of these apparently abnormal structures have been originated by ants, and are still sustained by them; so that if their agency were withdrawn, the sacs would immediately tend to disappear from the leaves, the dilated branches to become cylindrical, and the lengthened branches to contract; and although the inheritance of structures no longer needed might in many cases be maintained for thousands of years without sensible declension, I suppose that in some it would rapidly subside and the leaf or branch revert to its original form.

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[1] Fiebrig's (1909) conclusion that the reddish brown color is produced by oxidations induced by formic acid is not likely to be substantiated.

[2] "Ant-agency in plant-structure; or the modifications in the structure of plants which have been caused by ants by whose long-continued agency they have acquired sufficient permanence to be employed as botanical characters."

He supposed that the ants induced the formation of the abnormalities in order to provide themselves with domatia during periods of inundation, and drew largely upon his remarkable fund of information concerning the flora of tropical America in support of this idea. He pointed out that the majority of the myrmecophytes occur in low swampy regions or regions that are periodically inundated, and emphasized the fact that species which are entirely submerged during periods of high water are normal, whereas species which are only partly covered tend to be myrmecophytic.

> Seeing, then, how the sacs on the leaves have originated, and what purpose they serve, it is plain that a species of *Tococa*, like *T. planifolia*, inhabiting the very river's brink, and liable to be completely submerged for several months of every year, could never serve as a permanent residence for ants, nor consequently have any character impressed on it by their merely temporary sojourn; even if their instinct did not teach them to avoid it altogether, as they actually seem to do; whereas the species of *Tococa* growing far enough inland to maintain their heads above water even at the height of flood are thereby fitted to be permanently inhabited, and are consequently *never destitute of saccate* leaves, nor at any season of the year clear of ants. Nearly all tree-dwelling ants, although in the dry season they may descend to the ground and make their summer-houses there, retain the sacs and tubes abovementioned as permanent habitations; and some kinds of ants appear never to reside elsewhere, at any time of year. There are some ants which apparently must always live aloft; and the *Tococa* dwellers continue to inhabit Tococas where there is never any risk of flood, as in the case of *T. pterocalyx*, which grows on wooded ridges of the Andes. Their case is parallel to that of the lake-dwellers of the mouth of the Orinoco and the inundated savannas of Guayaquil, whose descendants must needs elevate their houses on stages six feet or more in height, although nowadays erected on rising ground far beyond the reach of floods or ocean-tides (Spruce).

Spruce did not consider that there was any true symbiosis between the ants and the plants as is indicated by the following statement in a letter to Darwin:

> The ants cannot be said to be useful to the plants, any more than fleas and lice are to animals; and the plants have to accommodate to their parasites as best they may.

Belt's Theory of Symbiosis

In 1874 Belt published the results of his observations upon leaf-cutting ants and certain myrmecophytic *Acaciæ*, and formulated an ingenious theory of myrmecophily. He concluded that the ants which inhabit the "bull's-horn" *Acaciæ*.

> form a most efficient standing army for the plant, which prevents not only the mammalia from browsing on the leaves, but delivers it from the attacks of a much more dangerous enemy—the leaf-cutting ants. For these services the ants are not only securely housed by the plant, but are provided with a bountiful supply of food; and

> to secure their attendance at the right time and place this food is so arranged and distributed as to effect that object with wonderful perfection. The leaves are bi-pinnate. At the base of each pair of leaflets, on the mid-rib, is a crater-formed gland, which when the leaves are young, secretes a honey-like liquid. Of this the ants are very fond; and they are constantly running about from one gland to another to sip up the honey as it is secreted. But this is not all; there is a still more wonderful provision of more solid food. At the end of each of the small divisions of the compound leaflet there is, when the leaf first unfolds, a little yellow fruit-like body united by a point at its base to the end of the pinnule. Examined through the microscope, this little appendage looks like a golden pear. When the leaf first unfolds, the little pears are not quite ripe and the ants are continually going from one to another, examining them. When an ant finds one sufficiently advanced, it bites the small point of attachment; then, bending down the fruit-like body, it breaks it off and bears it away in triumph to the nest. All the fruit-like bodies do not ripen at once, but successively, so that the ants are kept about the young leaf for some time after it unfolds. Thus the young leaf is always guarded by the ants; and no caterpillar or larger animal could attempt to injure them without being attacked by the little warriors.

These facts lead Belt to the conclusion that the function of the honey-secreting glands of plants is to attract insects which protect the flower-buds and leaves from the attacks of phytophagous insects and herbivorous mammals; and, by analogy, that the sugary secretions of various plant lice, scale insects, and leaf-hoppers have a similar function in attracting ants for the protection of these insects.

Delpino's Hypothesis

A similar explanation of the function of extrafloral nectaries was put forward by Delpino in a paper read in 1873 (published in 1874–75).

> What then is the function of the extranuptial nectaries, which are found on the caulinary leaves, on the bracts, and on the calyx? Though I reserve for another paper the publication of my studies of such and other extra-dichogamic relations between plants and insects, I do not hesitate to announce now that the chief function of these nectaries is to place the ants, wasps, and *Polistes* in the position of sentries and guards, to prevent the tender parts of the plant from being destroyed by larvæ.[1]

He elaborated this hypothesis in subsequent papers and reached the following conclusion (1889) in regard to myrmecophilous plants:

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[1] "Qual è dunque la funzione dei nettarii estranuziali, sia che si trovino sulle foglie cauline, sulle brattee o sul calice? Quantunque noi ci riserbiamo in altro lavoro di publicare i nostri studii sovra siffatte ed altre relazioni estradicogamiche tra le piante e gl'insetti, non esitiamo fin d'ora ad enunciare che siffatti nettarii hanno per funzione principale di costituire nelle formiche, nelle vespe, nei *Polistes* altrettante vigili sentinelle e guardiani per impedire che le parti tenere delle piante siano divorate dai bruchi."

Kerner von Marilaun (1876) has also advanced the view that the function of extrafloral nectaries is to prevent ants from plundering the nectar from flowers and thus interfering with the normal processes of insect-fertilization.

In the case of myrmecophilous species, the plant works for the ant in two ways, either in supplying a sugared food, or in furnishing suitable lodgings, and the ant works for the plant in defending it against its enemies.[1]

Beccari's Hypothesis

Beccari (1884-86), like Richard Spruce, endeavored to account for the origin of the peculiar structural modifications of various myrmecophytes upon the basis of the Inheritance of Acquired Characters. The following extracts from his beautifully illustrated work upon the myrmecophytes of Malasia are significant in this connection:

> Among insects, *e. g.* the ants, endowed with burrowing habits and also attracted by nutritive substances and fleshy tissues, may have sought, by piercing the bark and the ligneous parts, to enter certain branches or certain twigs. Having taken away the easily removable tissues, they may have succeeded in obtaining a commodious cavity in which to nest. During this performance the ants may have stimulated, although unconsciously, the walls of the inhabited cavity, which in consequence of the stimulus, may have grown and become ulteriorly modified. So that finally, in the course of time, they may have produced twigs that were normally provided with sheltering cavities. The argument, if valid for the twigs, may also be applied to the spines, to the pouches on leaves or roots, or to any other organ. If the ants did not always use a definite spot in order to gain access into the cavity, or if the entrance was made on a place where no sensitive protoplasma was present, the aperture would not become hereditary (*Acacia cornigera*, *Endospermum*); if, on the contrary, the ants continually selected some particular spot for perforation, and especially if the latter was near accumulations of sugary or mucilaginous substances, areoles may be produced where the tissues offered less resistance than elsewhere (*Cecropia*) and which subsequently became absolutely open (*Clerodendron fistulosum*). . . . The "food-bodies" of *Acacia cornigera* seem to me to have perhaps had this origin. . . . I am therefore of opinion that, because of the long time during which the stimulus of the ants acted upon the bulbose hypocotyle of *Myrmecodia* and related genera, a period of hereditary production (perhaps more pronounced in certain species than in others) has begun even of the galleries of the tuber, which are the essential part of the organ with which the plant acts as a host. In this way it may happen that this organ at once assumes the growth of a tuber, which, under certain circumstances, may remain in life and also grow independent of ants.[2]

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[1] "Nel caso delle specie mirmecofile, la piante lavora per la formica in due modi o somministrandole un alimento zuccherino, o fornendole comodità di alloggio, e la formica lavora per la piante difendendola dai suoi nemici."

[2] "Le formiche per es. fra gli insetti, dotate di abitudini perforatrici, attratte forse da sostanze nutritizie o da tessuto flosio, possono aver cercato, perforando la scorza e la parte legnosa, di introdursi nell' interno di certi rami o di certi fusti, e quivi asportando il tessuto facilmente removibile, possono esser riuscite a procurarsi una cavità comoda, nella quale fare il nido. In queste manovre le formiche avranno stimolato, anche senza volerlo, le pareti della cavità abitata, la quale in causa degli stimoli ricevuti potrà accrescersi e modificarsi a seconda delle circostanze, per finire coll' andar del tempo a dare origine per eredità a dei fusti, che naturalmente producono cavità ospitatrici. Il ragionamento che vale per i fusti può egualmente applicarsi alle spine, ai piccioli delle foglie a alle radici ed a qualunque altro organo. Se le formiche non si saranno sempre servite di un posto determinato per accedere nella cavità, o se l'apertura sarà stata praticata in luogo dove non esiste protoplasma sensibile, l'apertura non si renderà ereditaria (*Acacia cornigera*, *Endospermum*); se però le formiche approfitteranno costantemente di qualche punto speciale per la perforazione e sopratutto se questo sarà un luogo dove esistono accumulamente di sostanze zuccherine o mucillaginose, si potranno produrre delle areole, dove il tessuto offrirà meno resistenza che altrove (*Cecropia*) a che alla lunga diventerà assolutamente pervio (*Clerodendron fistulosum*). . . . I "food-bodies" dell' *Acacia cornigera*, mi pare che potrebbero avere avuto questa origine. . . . Sono però d'opinione che in causa del lungo tempo durante il quale lo stimolo delle formiche agisce sugli ipocotili imbulbiti delle *Myrmecodia* e generi affini, sia incominciato (forse in talune specie più che in altre) un periodo di produzione ereditaria anche per le gallerie del tubero, che costituiscono la parte essenziale dell' organo ospitatore, per cui può accadere che una volta avviata la vegetazione dei tuberi, questi in certe circostanze possano mantenersi in vita ed anche accrescersi indipendentemente dalle formiche."

Other Hypotheses

Fritz Müller (1880–81) and A. F. W. Schimper (1888) brought together considerable evidence, particularly in the case of *Cecropia*, to show that myrmecophytism is a true symbiosis, that the ants actually protect their hosts and that the food-bodies, extrafloral nectaries and many of the peculiar structural modifications of myrmecophytes are adaptations for the purpose of attracting ants. It should be noted in passing, however, that "Schimper's theory" of myrmecophily is not essentially different from the earlier hypothesis of Belt.

In 1900 Buscalioni and Huber published a short paper, "Eine neue Theorie der Ameisenpflanzen," in which they noted the abundance of myrmecophytic plants in swampy or inundated regions, and suggested that myrmecophytism originated under environmental conditions of this character, a view which, as I have shown, was championed by Spruce.

It is evident, accordingly, that there are in reality but two distinct theories of myrmecophytism; the Belt-Delpino hypothesis, or theory of symbiosis (myrmecophily), and the Lamarckian theory of Richard Spruce. The "theories" of Fritz Müller, Beccari, Schimper, Buscalioni and Huber, and others resemble in their fundamental features one or the other of these hypotheses.

Critics of the Theory of Myrmecophily

The Belt-Delpino hypothesis and the adherents of myrmecophily have been severely criticised in recent years by a number of different investigators. Möller (1893), Ule (1900), Rettig (1904), H. von Ihering (1907), Madame Nieuwenhuis von Üxküll-Güldenbrandt (1907), Fiebrig (1909), Wheeler (1913), and others have assailed the principal bastions of this theory and have succeeded in demolishing many of the principal arguments advanced in its support. Thus, it has been demonstrated that the ants are not sufficiently effective guardians of the plants to account for the origin of the various structural modifications of myrmecophytes through the action of Natural Selection. This is true even in the classical cases of the myrmecophytic *Cecropiæ* and *Acaciæ*. Furthermore, many plants which are not inhabited or frequently visited by ants are provided with pseudo-domatia, prostomata, food-bodies, extrafloral nectaries, etc.

Present Status of the Problem of Myrmecophytism

Although these investigators have succeeded in overthrowing the ingenious theory of Belt-Delpino and in showing that myrmecophytism is, in all probability, not a phenomenon of true symbiosis, but rather one of parasitism, they have failed to provide a satisfactory working hypothesis to account for the origin and functional significance of the various inherited structural peculiarities of myrmecophytes. For example, Madame Nieuwenhuis von Üxküll-Güldenbrandt (1907) states, at the end of her comprehensive monograph upon extrafloral nectaries, that biologists have no more idea in regard to the true meaning, origin, and functional significance of these glandular structures than they did in the time of Linnæus. We are equally in the dark concerning the so-called Beltian and Müllerian food-bodies, saccate leaves, fistulose or swollen, hollow stems and branches, prostomata, etc. It is true that the work of Treub (1883, 1888), Rettig (1904), Miehe (1911), and others indicates that the pseudobulbs, galleries, and papillæ of the *Myrmecodiæ* have a physiological origin and function, but their results are not entirely conclusive.

In view of the taboo that has been placed upon the Inheritance of Acquired Characters (owing to the seeming impossibility of proving, or disproving, the validity of this phenomenon) the simple Lamarckian explanations of Richard Spruce and Beccari are not likely to find many ardent supporters. Furthermore, the frequent occurrence of the same peculiar structural modifications, in plants which are not inhabited or visited by ants, is as serious a stumbling block in the way of the Spruce-Beccari hypothesis as it is in that of Belt-Delpino.

The present status of the problem of myrmecophytism may be summarized, therefore, as follows. Certain plants tend—for reasons which are at present obscure—to form extrafloral nectaries, food-bodies, prostomata, saccate leaves, fistulose branches, and other pseudodomatia, etc. In many cases, but by no means in all, these structural modifications of plants are taken advantage of by ants in their search for food and domatia. The myrmecophytic relationship which results is purely a case of parasitism in which all of the advantage lies with the ants.

My own observations upon myrmecophytism among African plants lead me to believe that the relationship is solely one of parasitism; but one in which the behavior of the parasitic insects is particularly significant. Although there appears to be no valid reason for supposing that the ants have been, or are now, concerned in the origin and development of the pseudo-domatia or peculiar modifications of the central cylinder that are associated with phyllotaxy, histological and other evidence indicates conclusively that the callus-heteroplasias, as well as the remarkable exit apertures of *Vitex Staudtii*, are traumatisms induced by the ants.

Origin of the Pseudo-gall-forming Habit

It is to be emphasized that the pit-like excavations, containing nutritive callus-heteroplasias, occur in plants of different growth forms (belonging to three distinct orders, Parietales, Tubifloræ, and Rubiales) and are produced, not only by the "obligatory" *Viticicola* and *Pachysimæ*, but also by the ubiquitous, "facultative" *Crematogasters*. In the case of the highly modified and specialized *Viticicola tessmanni*, the gall-like structures of *Vitex Staudtii* are very complex histologically and their production appears to be under more delicate control, as is evidenced by their characteristic form and structure and very symmetrical distribution. In the flacourtiaceous and rubiaceous myrmecophytes, on the other hand, not only do the individual excavations vary greatly in size and shape, but their distribution is more or less erratic and there are numerous evidences of "trial and error" in their production. Whereas in *Vitex Staudtii* the ants almost invariably cut their excavations to just the right depth (the level of the cambium and inner cortex) to produce ingrowths of delicate, undifferentiated, nutritious parenchyma and gnaw away the inner margin of this layer at a rate which yields the most favorable results, the *Crematogasters*, *Engrammata*, and "obligatory" *Pachysimæ* frequently cut their way to the outer cortex, epidermis, or exterior and induce the formation of heteroplasias which, owing to the differentiation of more or less sclerenchyma, wound-wood, wound-cork, etc., are less nutritious and more difficult to control during the subsequent process of feeding.

The question naturally suggests itself, how did these pseudo-gall-forming habits originate among ants? There are certain general tendencies in the growth of plants and in the activities of ants which appear to throw some light upon this problem.

In woody plants, the cortex and cambium (and its derivative tissues) are under a certain equilibrium as regards mechanical strains and stresses, osmotic forces, distribution of moisture and food-substances, etc. When this equilibrium is disturbed by mechanical injuries, the polarity, rate of division, physiological activity and differentiation of the cells of the cambium and cortical parenchyma are more or less profoundly modified, depending upon the type and severity of the injury, the kind of plant, and its stage of development, etc. Abrasions and perforations, which extend through the cortex, phloem, and cambium to the xylem or medulla, tend to alter the polarity of the cambial cells in the immediate vicinity of the injury and to cause them to divide more actively. This change in polarity and acceleration in growth, which commonly extends to the parenchyma of the overlying tissues, produces lateral out-growths of delicate, thin-walled, unlignified, more or less isodiametric cells from the sides of the wound. These callus-formations gradually bridge over the gap in the side of the stem and lead ultimately to a regeneration of the missing portions of the cambium, cortex, xylem, and phloem. However, the differentiation of the cells of the callus does not result at once in the production of normal tissues, but of so-called wound-wood, wound-cork, etc. These wound-tissues vary greatly in form, structure, and arrangement, depending upon a number of different factors. Furthermore, there tends to be a considerable concentration of food-substances (protein, fats, sugars, etc.) in callus-heteroplasias and frequently of gums, mucilages, resins, tannins, etc. in the tissues which are differentiated from them.

The entrance and exit apertures, made by ants in the sides of myrmecodomatia, usually become occluded by wound-tissues unless they are kept open by the ants. For example, F. Müller (1880-81) found that in *Cecropia* the perforations made by *Azteca* queens in entering the primordial, internodal chambers frequently heal over and have to be reopened upon the exit of the young colony. Similar occluded apertures are of common occurrence in abandoned myrmecodomatia and domatia whose inhabitants have died or been killed by other insects. In clearing the entrance and exit holes, the ants are forced to gnaw upon the callus-heteroplasias. Therefore, since these tissues are usually well supplied with nutrient substances, as is indicated not only by microchemical analyses, but also by the fact that they are frequently fed upon by coccids, it might be expected *a priori* that the ants would discover the nutritive value of the callus and in many cases endeavor to increase its volume. The simplest and most direct method of producing additional callus-heteroplasias in the African myrmecophytes, and in other plants having similar myrmecodomatia, is for the ants to cut through to the cambium from the inside of their domatia. The moist, dark environment in the interior of the domatia favors a luxuriant growth of callus and tends to retard the differentiation of its cells, whereas the general environment upon the exterior of the myrmecodomatia appears in most cases to have an opposite effect. This is indicated by the structure, form, and development of callus-outgrowths from perforations in the walls of fistulose stems and branches. The heteroplasias tend to grow more rapidly in the direction of the moist central chambers than they do laterally or towards the exterior, so that they frequently project more or less into the domatia; and, as shown in Pl. XL, fig. 1, the differentiation of the cells proceeds more rapidly in the external than in the inner portions of the heteroplasias.[1]

In the myrmecophytic *Cuvieræ*, *Plectroniæ*, and *Barteriæ*, the callus heteroplasias which grow out from the margins of the entrance apertures resemble those that develop in the pit-like excavations. When the cells of the latter are filled with an amber-colored substance, the elements of the former contain this material which is fed upon by coccids and also apparently by the ants.

In view of these facts, it is not surprising that the pseudo-gall-forming habit should have originated among several genera of African twig-inhabiting ants, the facultative *Crematogasters* as well as the obligatory *Pachysimæ* and *Viticicola*. The remarkable fact is that the pseudo-cecidia should occur in a number of African myrmecophytes, belonging to three distinct orders, and not have been recorded in similar myrmecophytes from other tropical or subtropical regions. Of course, this may be due largely to structural and other differences in the myrmecodomatia, or to differences in the general growth-conditions of the vegetation, but I am inclined to believe that the phenomenon occurs in extra-African myrmecophytes and has been overlooked. For example, I find that the myrmecodomatia of *Nauclea formicaria* Elmer and of an unidentified Philippine myrmecophyte contain bisymmetrically arranged lateral excavations and callus-heteroplasias which resemble those of the African *Cuvieræ*. These myrmecodomatia were inhabited by species of *Decacrema* and *Camponotus* respectively. Furthermore, as has been pointed out earlier in this paper, the "stomatomes" of *Cecropia*, which contain colonies of *Aztecæ*, resemble the heteroplasias of *Plectronia* species *A*, and, although they are not situated in pit-like excavations, may prove to be homologous structures.

Sclerenchymatous Rings and Caps of *Vitex Staudtii*

Just as certain abnormal environmental conditions, caused by mechanical injuries, lead to the formation of delicate, undifferentiated callus, others produce the transformation of thin-walled parenchyma into sclerenchyma. Thus, one commonly finds more or less sclerenchyma in those portions of the bark which overlie the excavations in the walls of the myrmecodomatia of the *Cuvieræ* and *Plectroniæ*. Similarly, the outer surfaces of the exit apertures are often more or less completely jacketed by sclerenchyma. When the inwardly projecting callus has been completely gnawed away by the ants, as frequently happens, this dense layer of tissue must serve as a more or less effective barrier to the growth of additional occluding tissue from the sides of the apertures.

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[1] In *Cecropia* these ingrowths of callus, which are unusually large and conspicuous, may continue to grow and even proliferate after the entrance apertures are entirely closed by wound-tissue.

I have emphasized the fact that in *Vitex Staudtii* the lateral excavations and callus-heteroplasias are remarkably similar in form and structure and very symmetrically distributed. There is an equal uniformity in the production of sclerenchyma, as is evidenced by the peculiar sclerenchymatous caps and rings which are such characteristic features in the anatomy of this myrmecophyte. In the absence of necessary experimental investigations, it is not possible to determine, however, whether *Vitex Staudtii* possesses a more pronounced tendency towards the formation of sclerenchyma than other myrmecophytes or whether the production of these peculiar structures is due solely to a more delicate control of ordinary traumatic phenomena by the highly specialized *Viticicola tessmanni*.

In conclusion, it is to be emphasized that these tropical "biocœnoses," in which representatives of the higher plants, fungi, ants, coccids, and nematodes are intimately associated, deserve to be carefully and critically studied in the field. They should form the basis for some exceedingly interesting physiological and ecological investigations.

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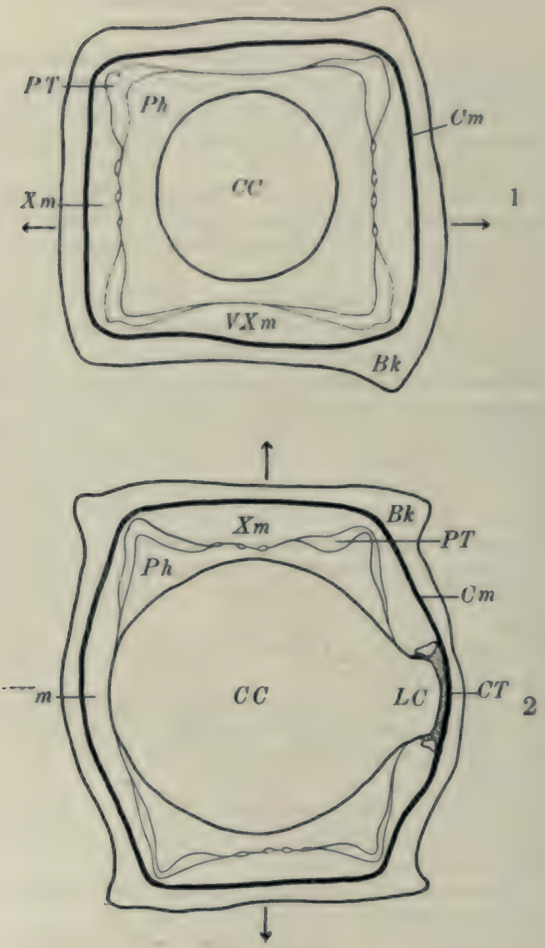


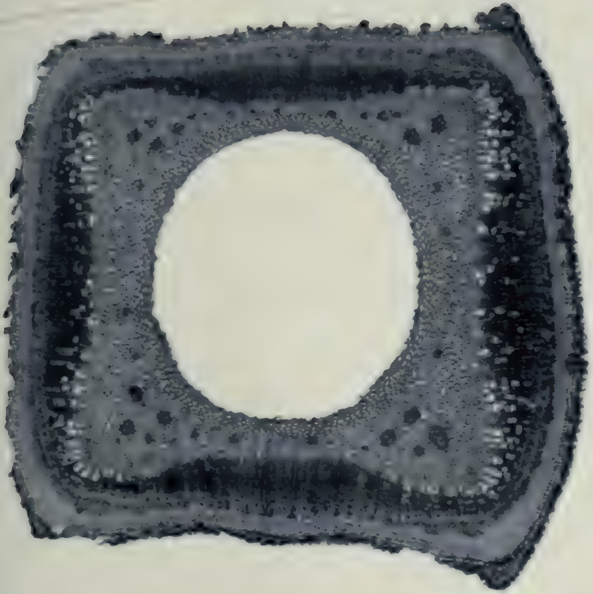
Plate XXX

Vitex Staudtii Guerke

Fig. 1. Transverse section of a young stem, cut just above a node (at the level A–A shown in Text Figure 88, p. 449): *CC*, central cavity; *Ph*, peripheral layer of pith; *PT*, primary tracheæ; *Xm*, secondary xylem containing vessels; *VXm*, secondary xylem devoid of vessels; *Cm*, cambium; *Bk*, bark. × 19.

Fig. 2. Transverse section of a young stem, cut just below the node (at the level B–B in Text Figure 88, p. 449): *CC*, central cavity; *LC*, lateral cavity; *CT*, shriveled callus; *Ph*, remains of peripheral layer of medullary tissue; *PT*, primary tracheæ; *Xm*, secondary xylem containing vessels; *VXm*, vesselless secondary xylem; *Cm*, cambium; *Bk*, bark. × 19.

The arrows indicate the sides of the stele which pass out into the leaves at the next (higher) node.



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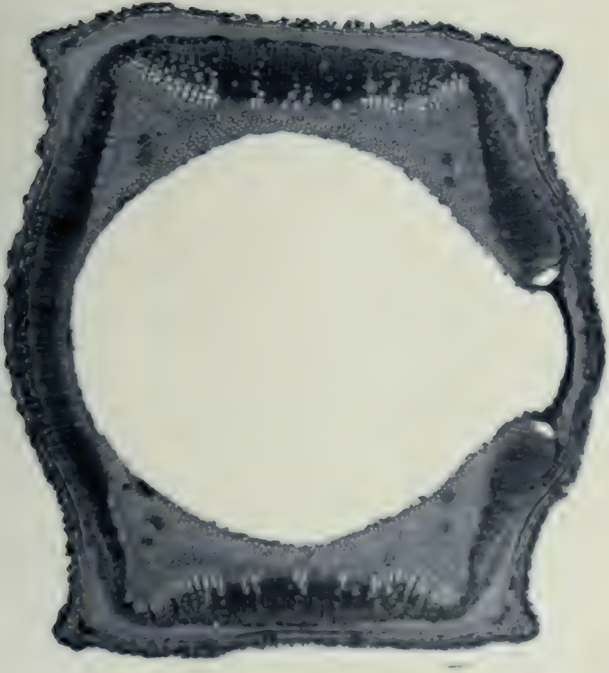

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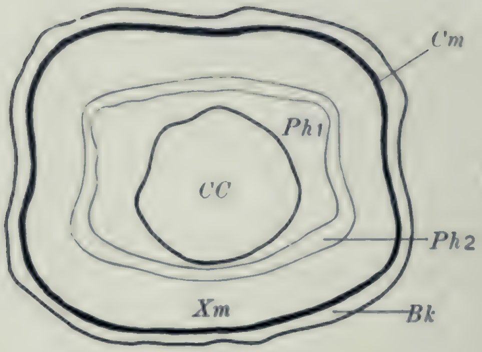

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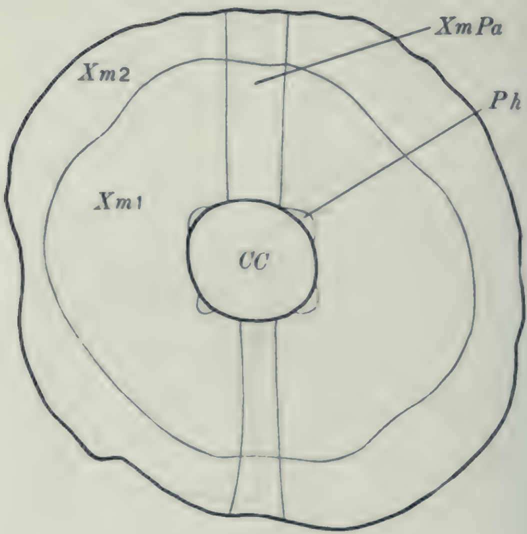

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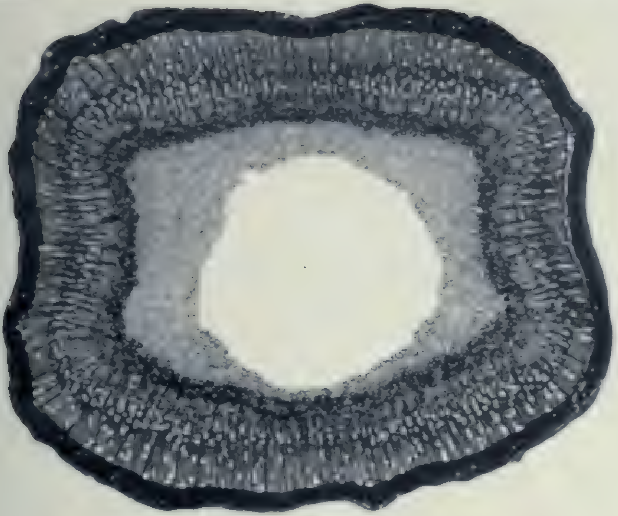
PLATE XXXI

Fig. 1. *Vitex littoralis* Decne. Transverse section of a young stem, showing a central cavity in a species which is not inhabited by ants: *CC*, central cavity; *Ph1*, thin-walled pith; *Ph2*, thick-walled pith; *Xm*, xylem; *Cm*, cambium; *Bk*, bark. × 12.

Fig. 2. *Vitex Staudtii* Guerke. Transverse section of a decorticated stem 18 mm. in diameter, showing six growth layers: *CC*, central cavity; *Ph*, remains of pith; *Xm1*, growth layers containing few vessels; *Xm2*, growth layers containing numerous large vessels; *XmPa*, radii of stem devoid of vessels, in which the formation of xylem parenchyma has been greatly accentuated by traumatic stimuli. × 7.



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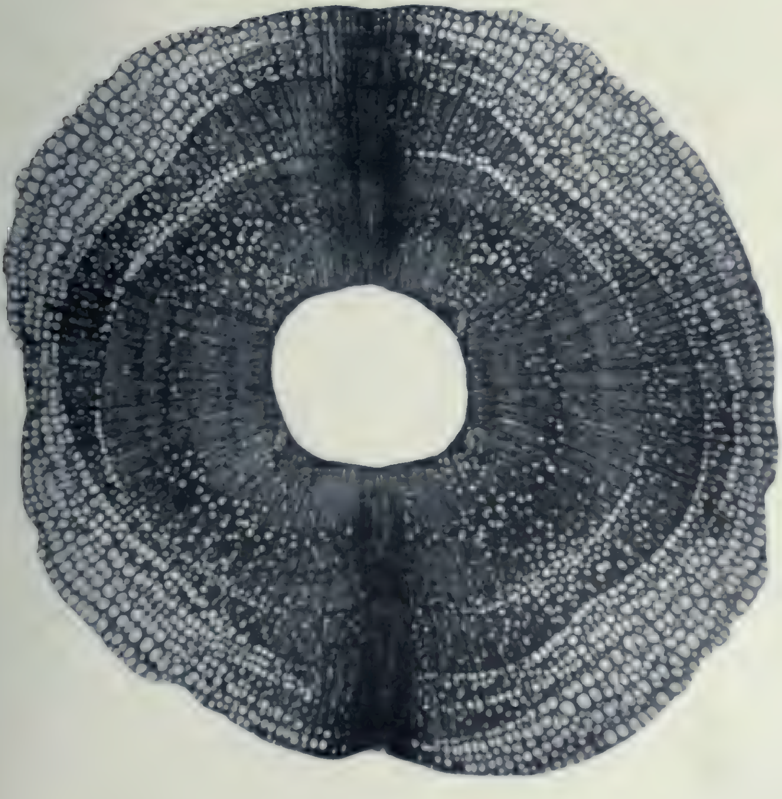

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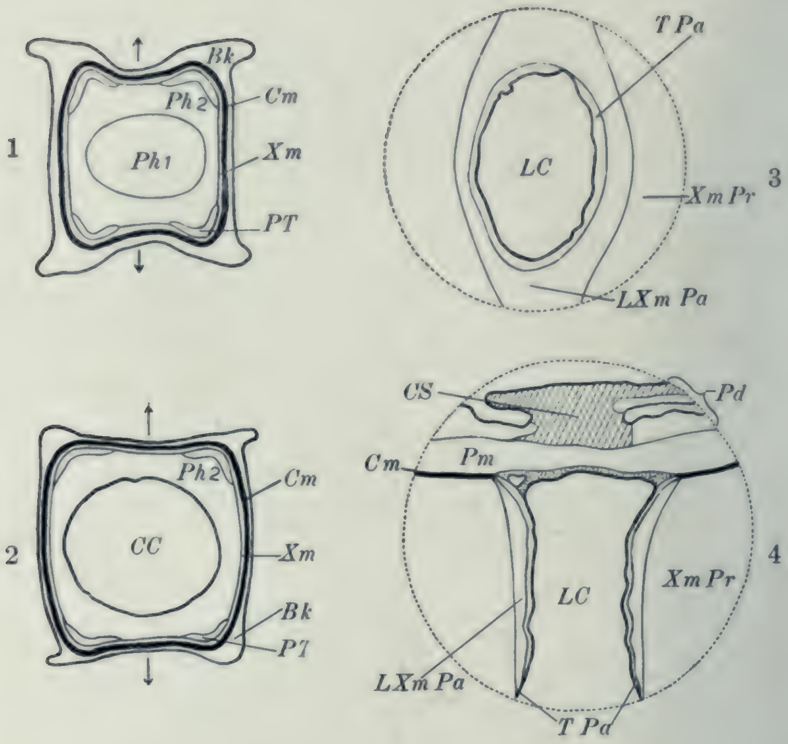


Plate XXXII

Vitex Staudtii Guerke

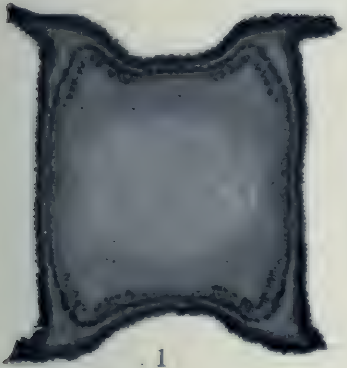
Fig. 1. Transverse section of a very young, tender stem, illustrating heterogeneous medulla and early stage in the differentiation of the "fibrovascular cylinder" or stele: *Ph1*, large-celled, thin-walled medullary tissue; *Ph2*, peripheral layer of medullary tissue composed of small cells; *PT*, primary tracheæ; *Xm*, xylem; *Cm*, cambium; *Bk*, bark. The arrows indicate the sides of the stele which pass out into the leaves at the next (higher) node. × 19.

Fig. 2. Transverse section of normal stem cut a short distance below that illustrated in Fig. 1: *CC*, central cavity; *Ph2*, peripheral layer of medullary tissue; *PT*, primary tracheæ; *Xm*, xylem; *Cm*, cambium; *Bk*, bark. The arrows indicate the sides of the stele which pass out into the leaves at the next (higher) node. × 19.

Fig. 3. Tangential longitudinal section of a stout stem, showing a cross-section of lateral cavity: *LC*, lateral cavity; *TPa*, shriveled remains of thin-walled, unlignified parenchyma; *LXmPa*, thick-walled, lignified xylem parenchyma; *XmPr*, prosenchymatous portion of xylem. × 33.

Fig. 4. Radial longitudinal section of stout dry stem, illustrating lateral cavity and outer cap of sclerenchyma: *LC*, lateral cavity; *TPa*, shriveled remains of thin-walled, unlignified parenchyma; *LXmPa*, thick-walled, lignified xylem parenchyma; *XmPr*, prosenchymatous portion of xylem; *Cm*, cambium; *Pm*, phloem; *Pd*, periderm; *CS*, sclerenchymatous disk or cap. × 26.

Fig. 5. Section of "nutritive" layer stained with Sudan III to differentiate fats. × 90.



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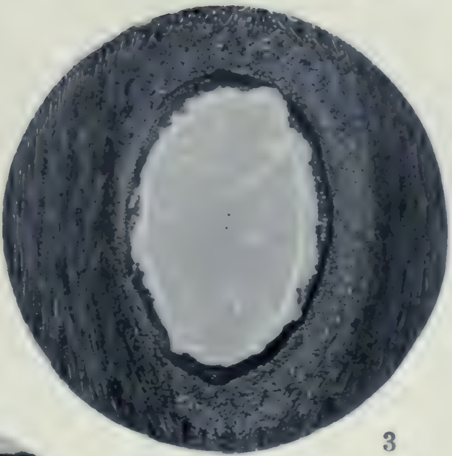

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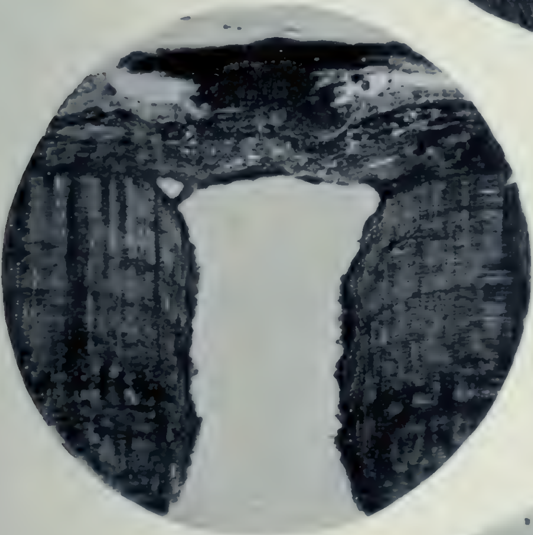

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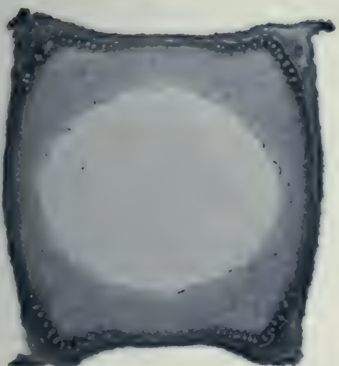

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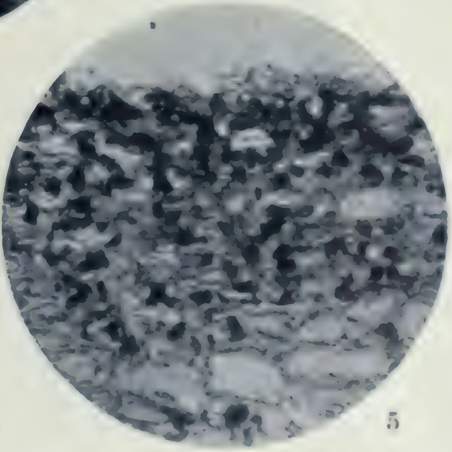

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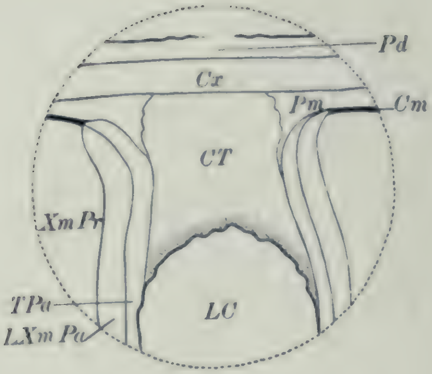

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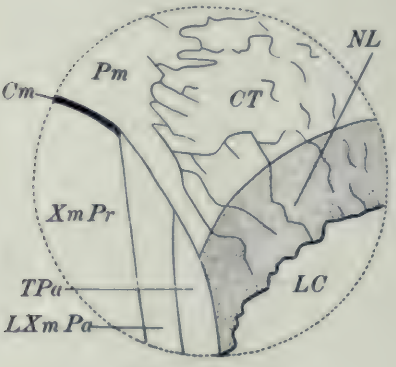

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PLATE XXXIII

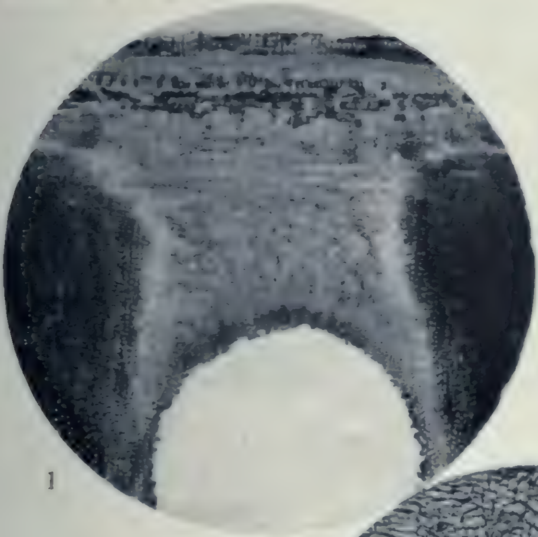
Vitex Staudtii Guerke

Fig. 1. Radial longitudinal section of stout stem preserved in alcohol, showing convex end of lateral cavity and tissues which surround it: *LC*, lateral cavity; *CT*, unlignified callus; *TPa*, thin-walled, unlignified parenchyma; *LXmPa*, thick-walled, lignified xylem parenchyma; *XmPr*, prosenchymatous xylem packed with starch; *Cm*, cambium; *Pm*, phloem; *Cx*, cortex; *Pd*, periderm. Stained with chloriodide of zinc. × 35.

Fig. 2. More highly magnified view of the tissues shown in Fig. 1. *LC*, lateral cavity; *NL*, "nutritive," inner layer of callus; *CT*, outer, larger-celled portion of callus; *TPa*, thin-walled, unlignified parenchyma; *LXmPa*, thick-walled, lignified xylem parenchyma; *XmPr*, prosenchymatous xylem; *Cm*, cambium; *Pm*, phloem. Stained with hæmatoxylin-safranin. × 60.

Fig. 3. Radial longitudinal section of xylem, showing septate, libriform fibers packed with starch. Section stained with chloriodide of zinc. × 170.

Fig. 4. Section of "nutritive" layer, illustrating ground mass of small, thin-walled cells and dark-colored strands of conducting tissue. × 200.



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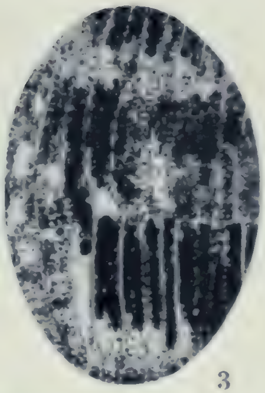

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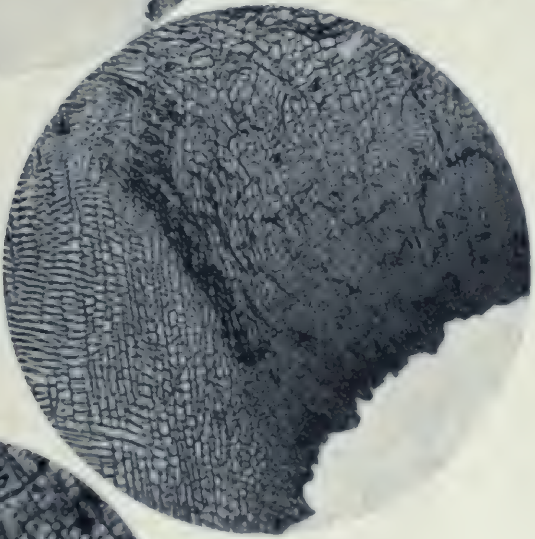

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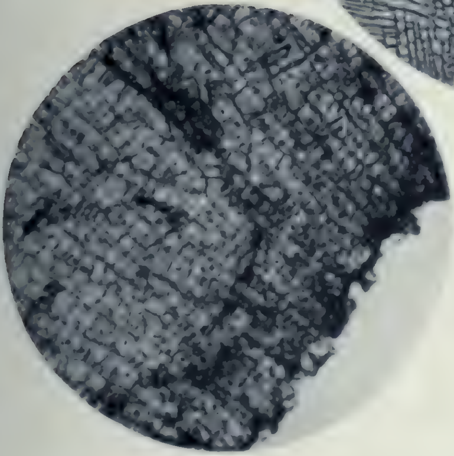

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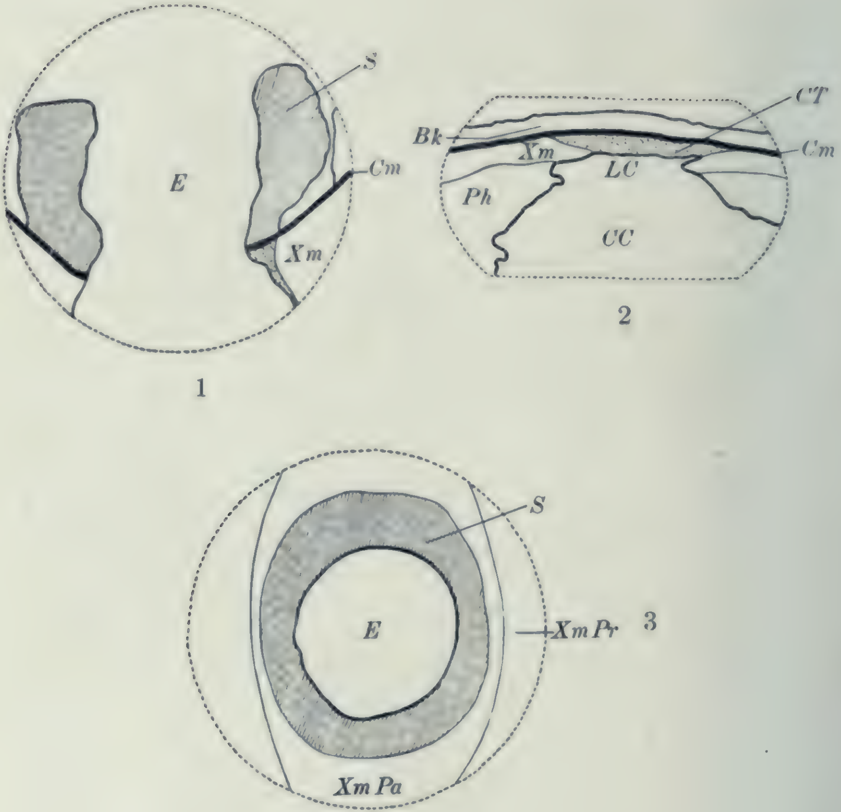


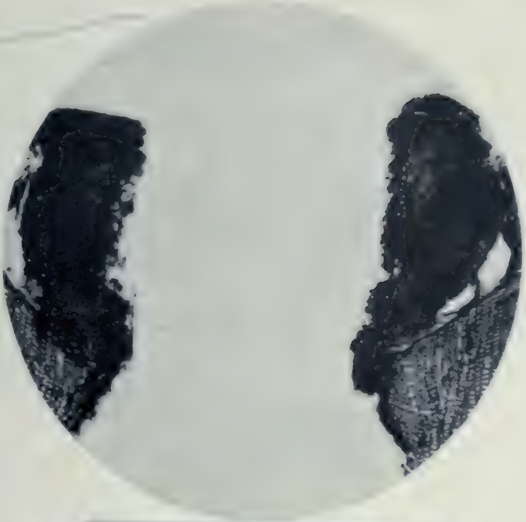
PLATE XXXIV

Vitex Staudtii Guerke

Fig. 1. Radial longitudinal section of stout stem with exit cavity (*E*) surrounded by a ring of sclerenchyma (*S*): *Xm*, xylem; *Cm*, cambium. × 43.

Fig. 2. Sector of transverse section cut just above the section illustrated in Pl. XXXII, Fig. 2, showing early stage in the formation of lateral cavity and nutritive layer: *CC*, central cavity; *LC*, lateral cavity; *Ph*, pith tissue; *Xm*, xylem; *CT*, callus; *Cm*, cambium; *Bk*, bark. × 38.

Fig. 3. Tangential longitudinal section of stout stem with exit cavity (*E*): *S*, ring of sclerenchyma; *XmPa*, parenchymatous portion of xylem; *XmPr*, prosenchymatous portion of xylem. × 38.



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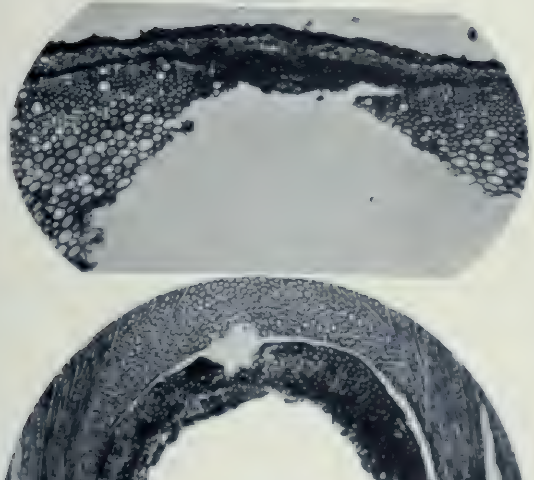

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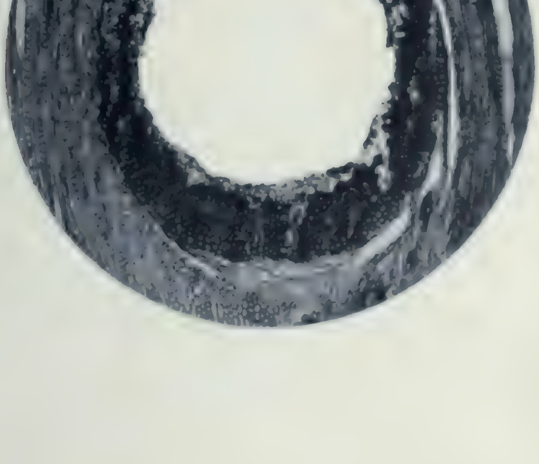

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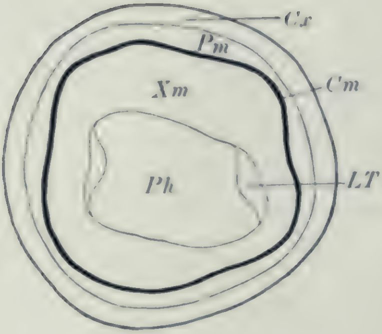

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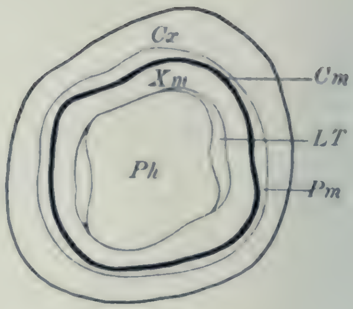

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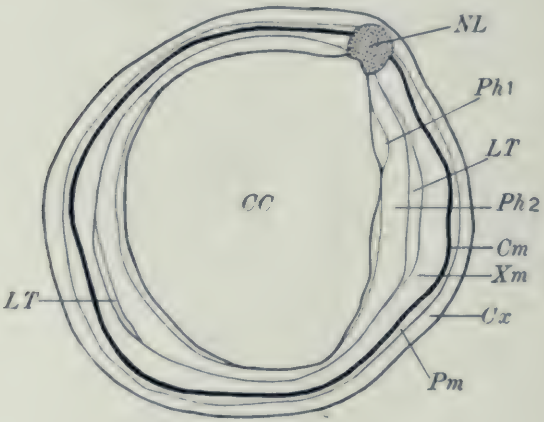

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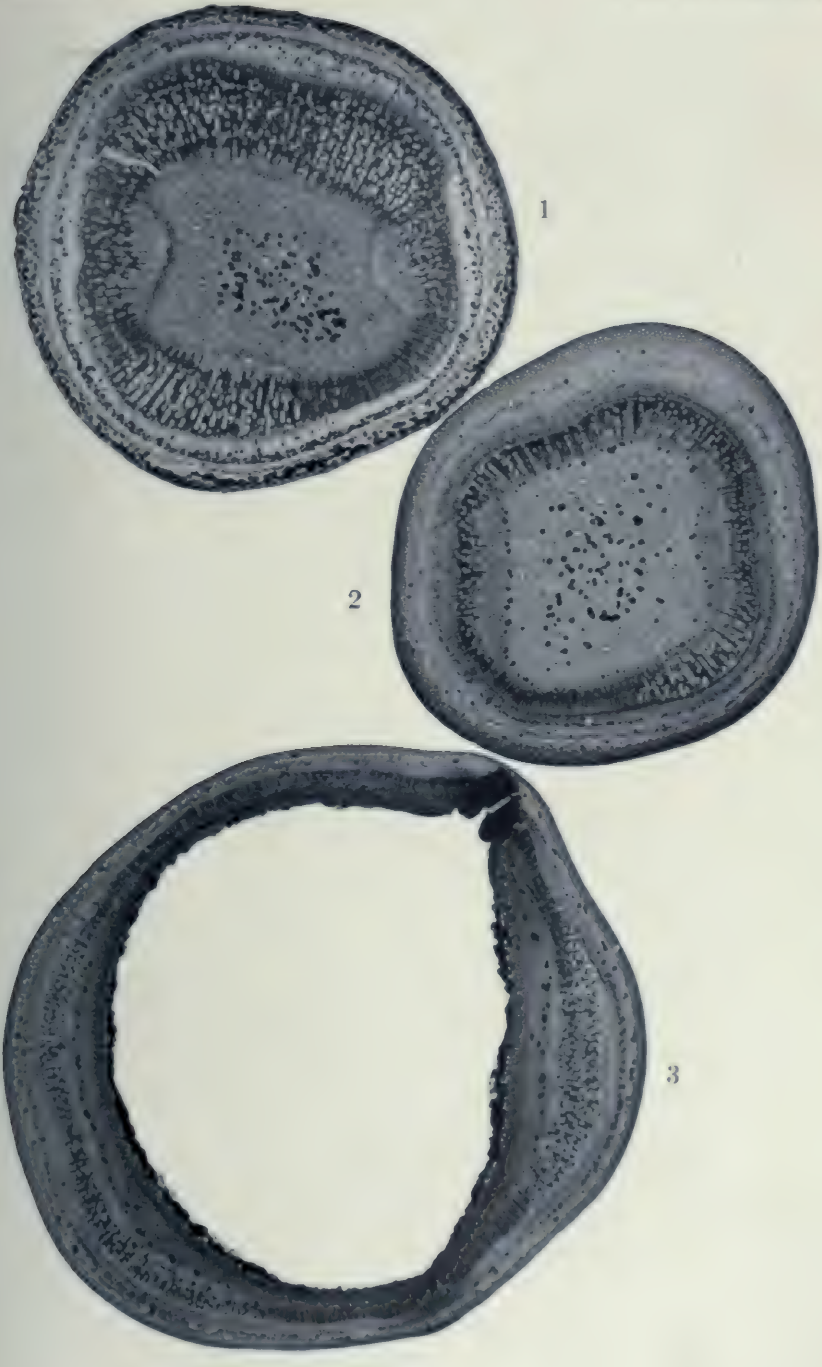
Plate XXXV

Fig. 1. *Cuviera* species? (collected at Kunga). Transverse section of normal, unswollen portion of internode: *Ph*, pith; *LT*, leaf trace bundles which pass out at the next (higher) node; *Xm*, cylinder of xylem; *Pm*, phloem; *Cm*, cambium; *Cx*, cortex. × 14.

Fig. 2. *Cuviera angolensis* Hiern (from the Tshopo River). Transverse section of normal, unswollen portion of internode: *Ph*, pith; *LT*, leaf trace bundles which pass out at the next (higher) node; *Xm*, cylinder of xylem; *Cm*, cambium; *Pm*, phloem; *Cx*, cortex. × 14.

Fig. 3. *Cuviera angolensis* Hiern. Transverse section of myrmecodomatium: *Ph1*, remains of thin-walled pith; *Ph2*, thick-walled pith; *LT*, leaf trace bundles which pass out at the next (higher) node; *Xm*, cylinder of xylem; *Pm*, phloem; *Cm*, cambium; *NL*, nutritive layer; *Cx*, cortex; *CC*, central cavity. × 11.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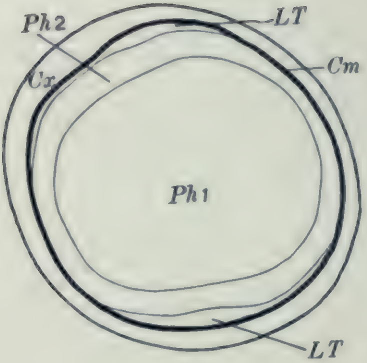

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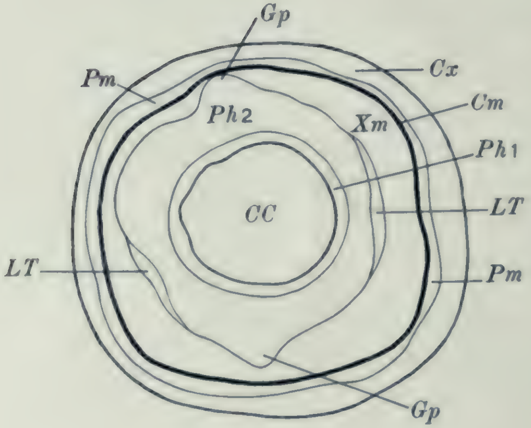

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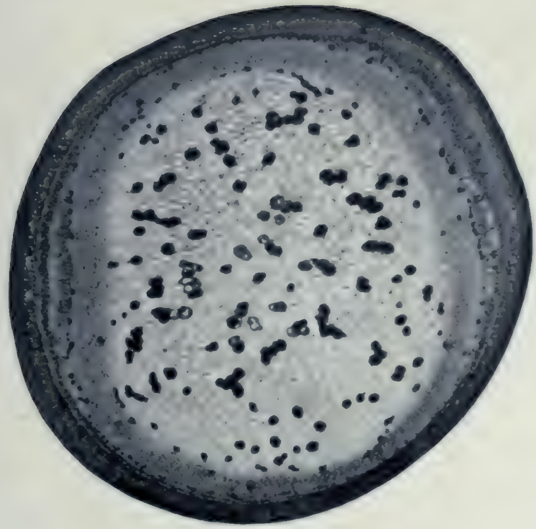
PLATE XXXVI

Cuviera angolensis Hiern

Fig. 1. Transverse section of the swollen portion of a very young stem, showing pulpy pith which later collapses and dries up: *Ph1*, thin-walled pith; *Ph2*, thick-walled pith; *LT*, leaf trace bundles which pass out at the next (higher) node; *Cm*, cambium; *Cx*, cortex. × 14.

Fig. 2. Transverse section of the base of a swelling on a stout stem, illustrating one phase in the formation of a cavity without the intervention of the ants: *CC*, central cavity; *Ph1*, remains of thin-walled pith; *Ph2*, thick-walled pith; *Xm*, xylem cylinder; *LT*, leaf trace bundles which pass out at the next (higher) node; *Gp*, gaps made by the exit of leaf trace bundles; *Cm*, cambium; *Pm*, phloem; *Cx*, cortex. × 12.



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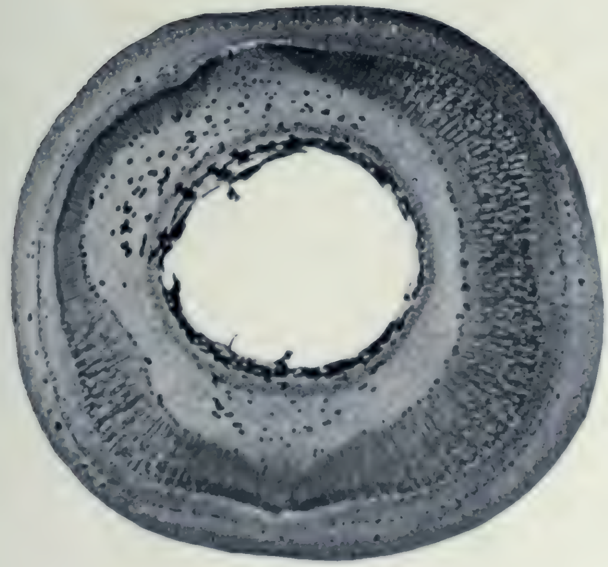

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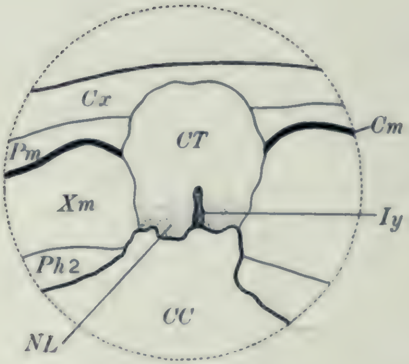

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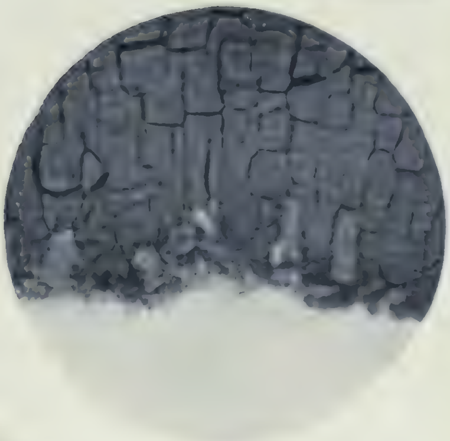
PLATE XXXVII

Fig. 1. *Cuviera* species? (collected at Kunga). Section of nutritive layer, showing chewed inner portion. × 210.

Fig. 2. *Cuviera angolensis* Hiern. Sector of a transverse section of myrmecodomatium, showing nutritive layer: *NL*, nutritive layer; *CT*, callus; *CC*, central cavity; *Ph2*, thick-walled pith; *Xm*, xylem; *Cm*, cambium, *Pm*, phloem; *Cx*, cortex. × 50.

Fig. 3. *Cuviera angolensis* Hiern. Section of inner edge of central cavity with thick-walled cells of pith, thin-walled cells of pith containing amber-colored substance, and aërial hyphæ of fungus. × 210.



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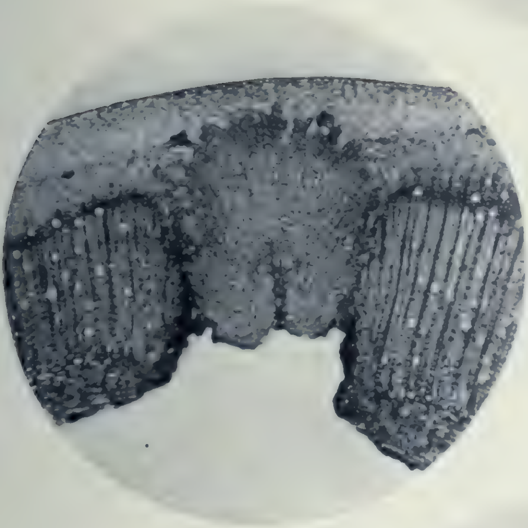

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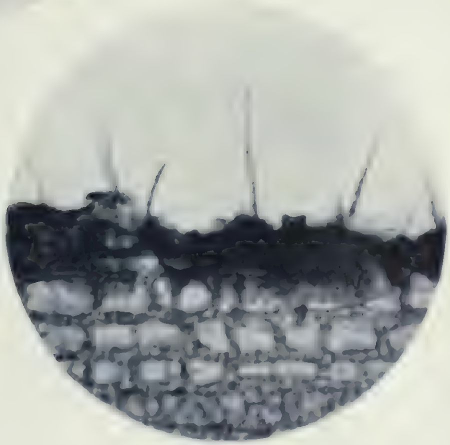

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Plate XXXVIII

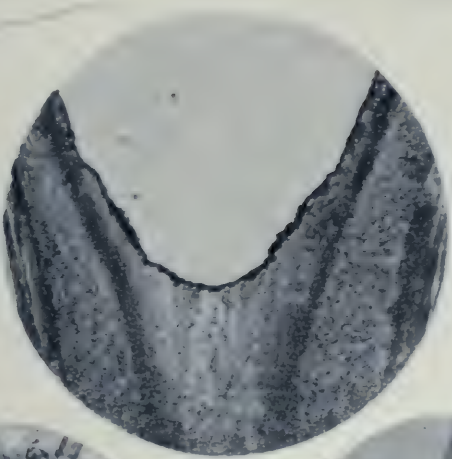
Cuviera species? (from Kunga)

Fig. 1. Longitudinal section of stem, showing fungus garden at base of central cavity. × 16.

Fig. 2. Portion of ant pellet composed entirely of hyphæ. × 400.

Fig. 3. Portion of detritus from base of central cavity showing nematodes. × 390.

Fig. 4. "Fungus garden," showing aërial hyphæ, substratum, and thick-walled cells of pith. × 160.



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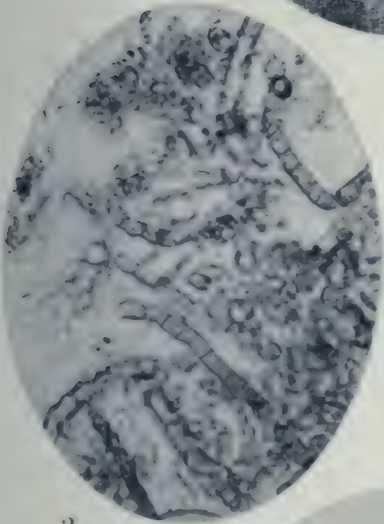

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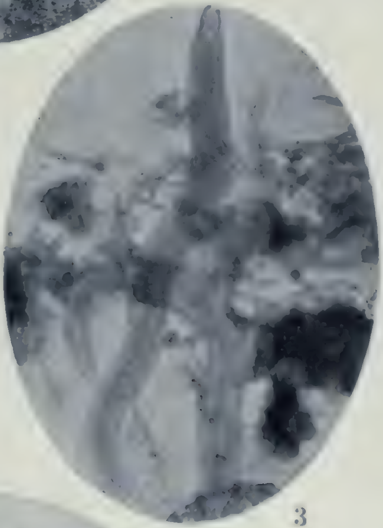

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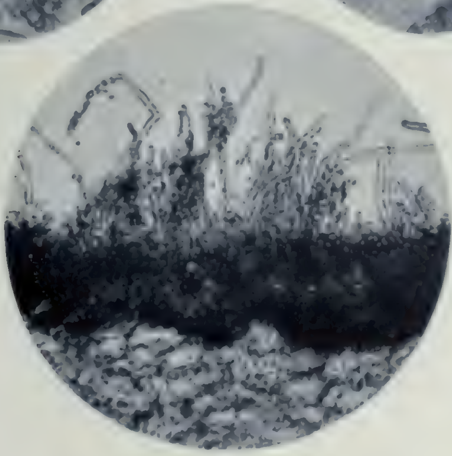

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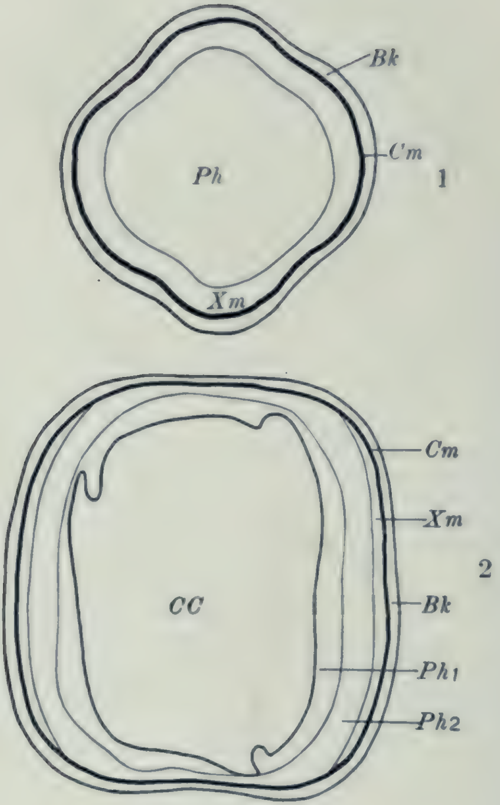
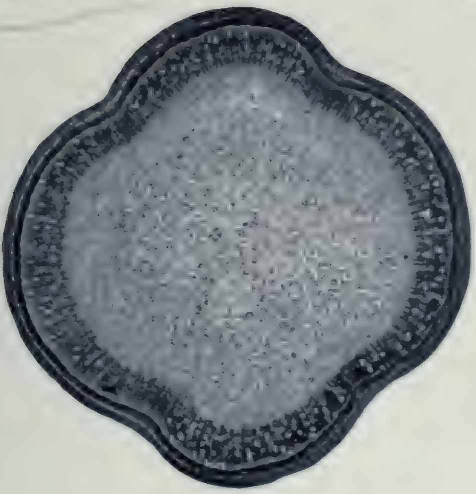


PLATE XXXIX

Plectronia species A (from the Tshopo River)

Fig. 1. Transverse section of young, normal internode: *Ph*, pith; *Xm*, xylem cylinder; *Cm*, cambium; *Bk*, bark. × 9.

Fig. 2. Transverse section of swollen portion of young stem, showing central cavity formed by the drying up of the thin-walled cells of the pith: *CC*, central cavity; *Ph1*, remains of thin-walled portion of pith; *Ph2*, thick-walled portion of pith; *Xm*, xylem; *Cm*, cambium; *Bk*, bark. × 9.



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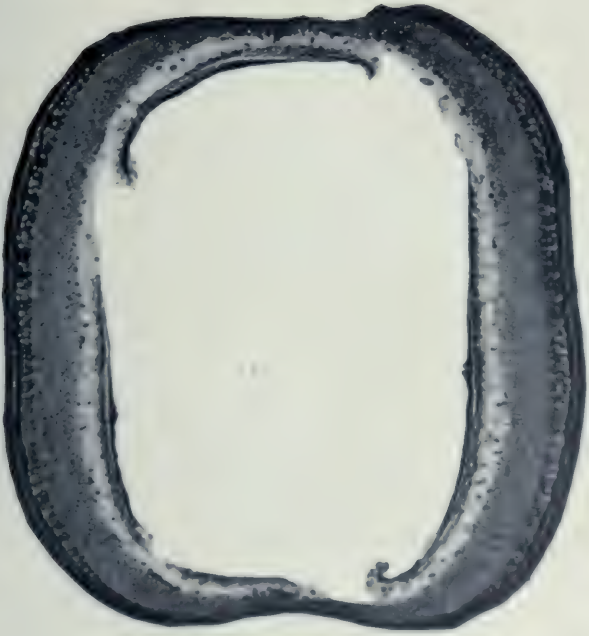

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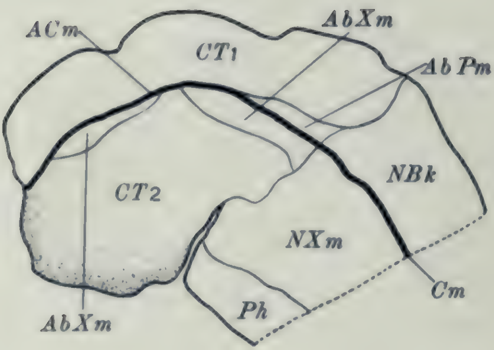

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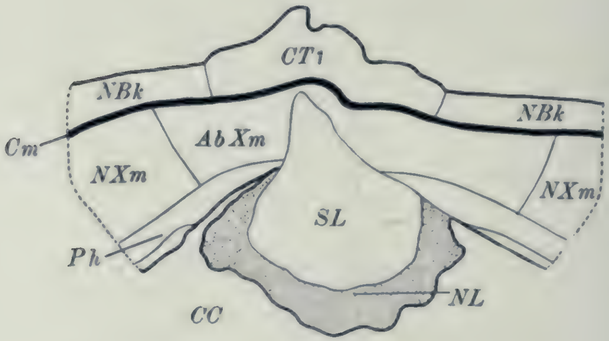

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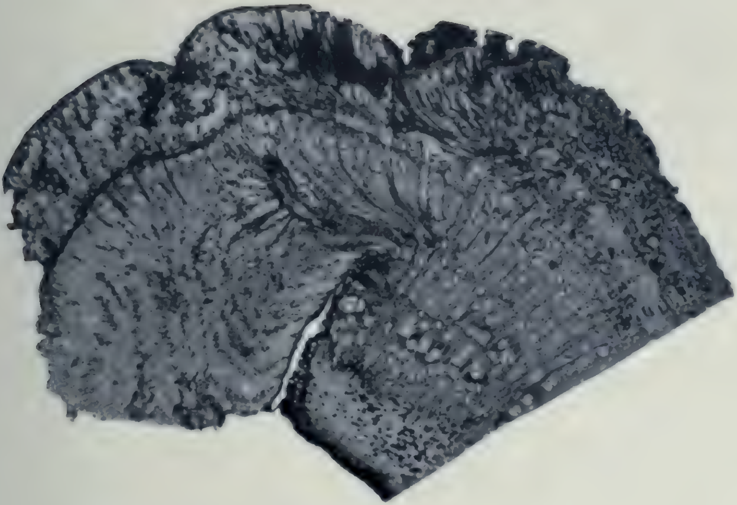
PLATE XL

Fig. 1. *Cecropia* species. Sector of a transverse section of a young stem, showing normal structure (right) and callus formation or "stomatome" (left). The latter is differentiated into two distinct portions: a darker outer layer and a light-colored hyperplasia which projects into the cavity of the stem; these two layers are separated by a meristematic layer which is continuous with the cambium: *Ph*, pith; *NXm*, normal xylem; *NBk*, normal bark; *AbXm*, abnormal xylem; *AbPm*, abnormal phloem; *CT1*, dark outer layer of callus formation; *CT2*, light-colored hyperplasia projecting into the cavity of the stem; *Cm*, normal cambium; *ACm*, meristematic layer of callus formation. × 10.

Fig. 2. *Plectronia* species A (from the Tshopo River). Sector of a transverse section of a myrmecodomatium, showing hyperplasia projecting into the cavity of the twig: *CC*, central cavity; *NL*, nutritive layer; *SL*, starch containing parenchyma; *Ph*, pith; *NXm*, normal xylem; *AbXm*, abnormal xylem; *NBk*, normal bark; *CT1*, external callus; *Cm*, cambium. The layers *SL* and *NL* together represent the tissue designated as *CT2* in Fig. 1. × 26.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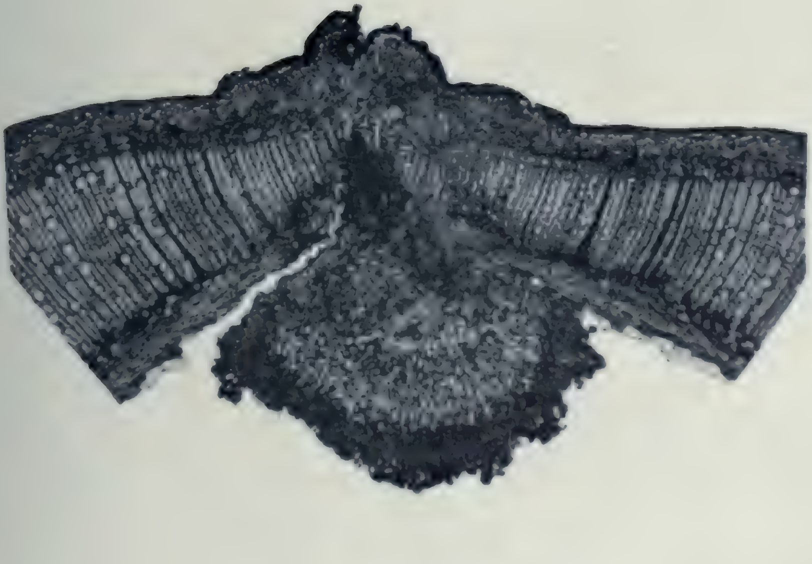
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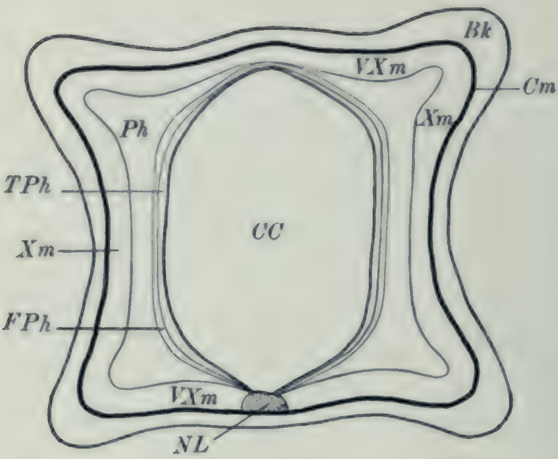

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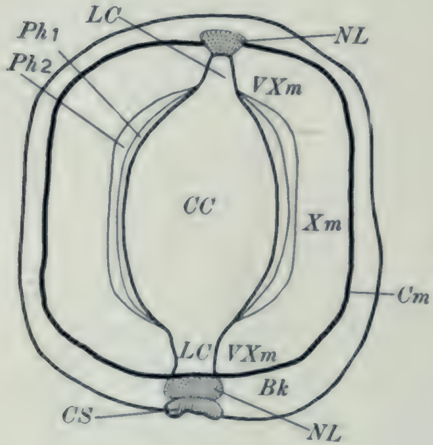

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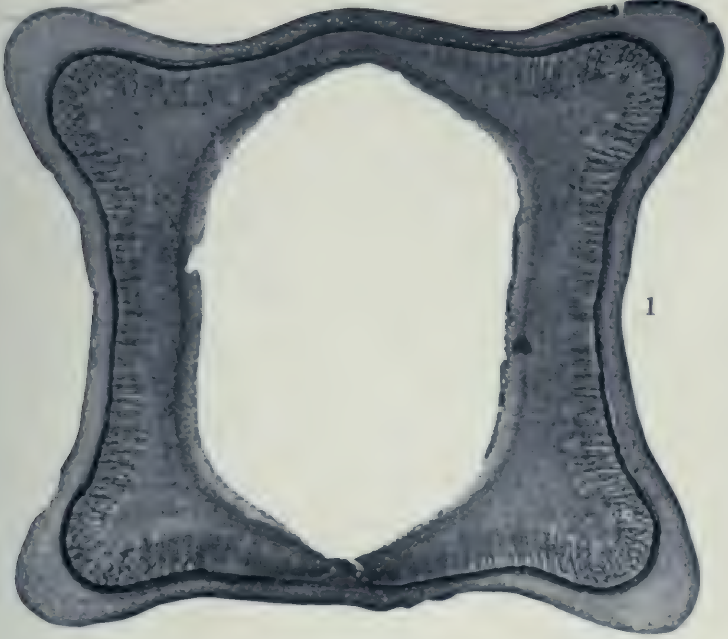
PLATE XLI

Plectronia Laurentii De Wildeman

Fig. 1. Transverse section of quadrangular, hypertrophied branch: *CC*, central cavity; *NL*, nutritive layer or callus; *Ph*, pith; *FPh*, layer of medullary tissue which consists of flattened, thick-walled cells; *TPh*, remains of thin-walled pith tissue; *VXm*, vesselless xylem; *Xm*, xylem containing numerous vessels; *Cm*, cambium; *Bk*, bark. × 6.

Fig. 2. Transverse section of less swollen myrmecodomatium: *CC*, central cavity; *LC*, lateral cavity; *CS*, cap of sclerenchyma; *NL*, nutritive layer; *Ph1*, layer of thin-walled medullary tissue; *Ph2*, layer of medullary tissue having thick-walled, flattened cells; *Xm*, xylem containing numerous vessels; *VXm*, vesselless xylem; *Cm*, cambium; *Bk*, bark. × 7.



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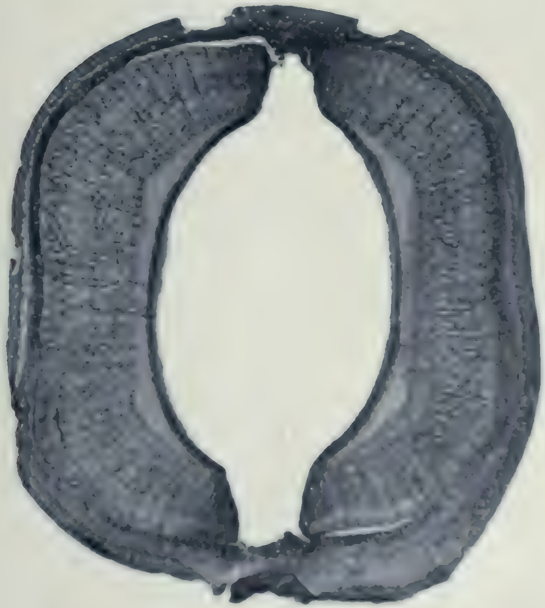

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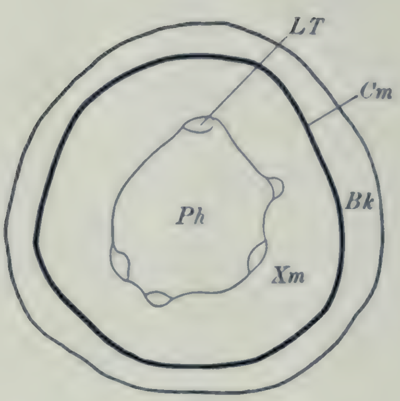

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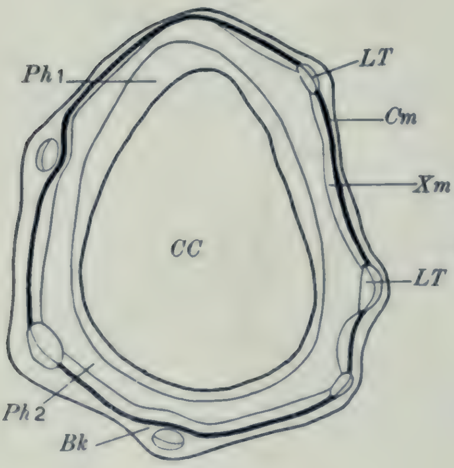

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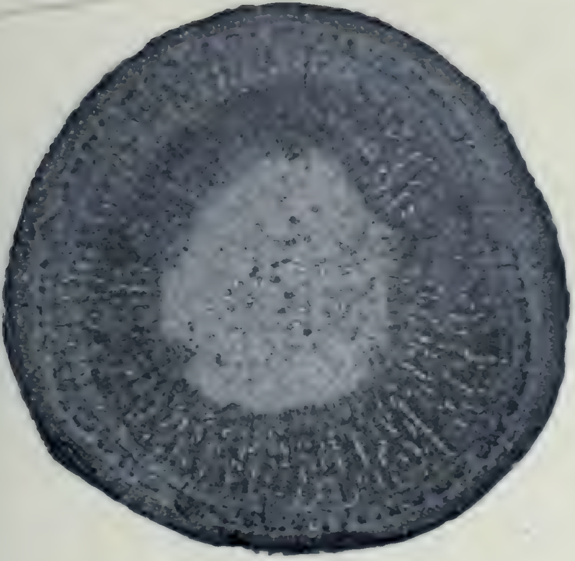
PLATE XLII

Barteria fistulosa Masters

Fig. 1. Transverse section of normal stem: *Ph*, pith; *Xm*, cylinder of xylem; *LT*, leaf trace bundles; *Cm*, cambium; *Bk*, bark. × 11.

Fig. 2. Transverse section of swollen stem, showing central cavity formed by the collapse and drying up of the thin-walled cells of the pith: *CC*, central cavity; *Ph1*, remains of thin-walled cells of pith; *Ph2*, thick-walled cells of pith; *Xm*, xylem; *LT*, leaf trace bundles; *Cm*, cambium; *Bk*, bark. × 10.



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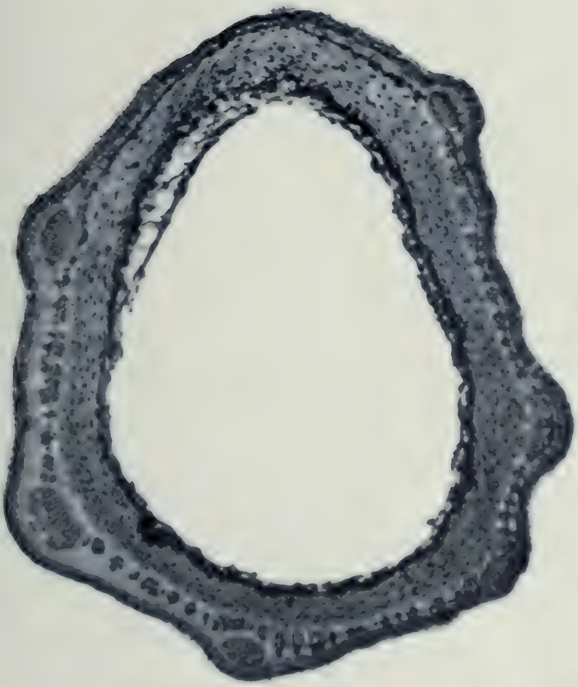

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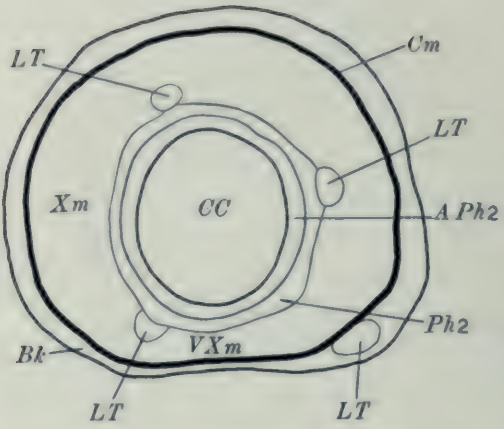

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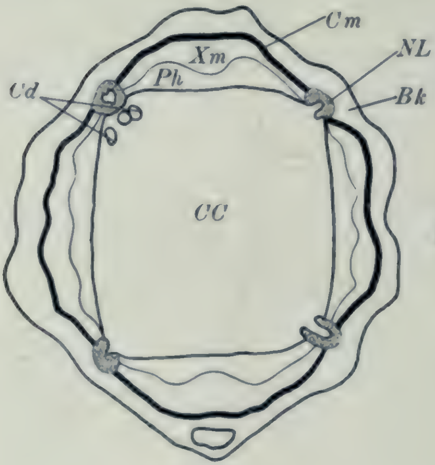

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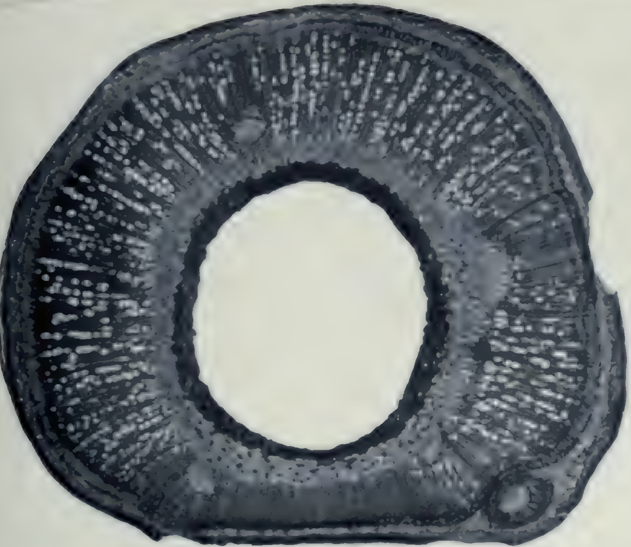
Plate XLIII

Fig. 1. *Barteria Dewevrei* De Wildeman and Durand. Transverse section of stout stem, showing heterogeneous pith, central cavity, and thin side of myrmecodomatium: *CC*, central cavity; *APh2*, layer of thick-walled, flattened pith cells that are filled with amber-colored, hyaline substance; *Ph2*, peripheral layer of medullary tissue; *LT*, leaf trace bundles; *VXm*, vesselless xylem; *Xm*, xylem containing numerous vessels; *Cm*, cambium; *Bk*, bark. × 10.

Fig. 2. *Sarcocephalus* species. Transverse section of dried myrmecodomatium, showing central cavity, heterogeneous medulla, and four nutritive layers: *CC*, central cavity; *Ph*, peripheral layer of medullary tissue; *Cd*, sections of coccids; *NL*, nutritive layer or callus; *Xm*, xylem; *Cm*, cambium; *Bk*, bark. × 8.



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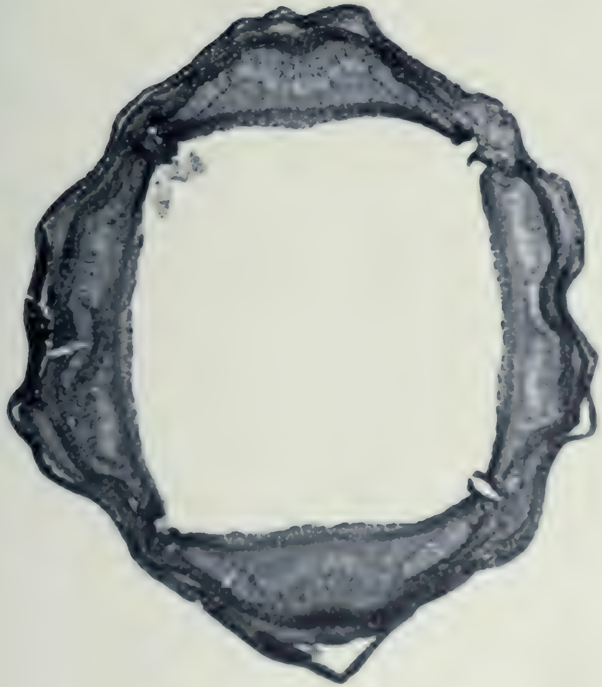

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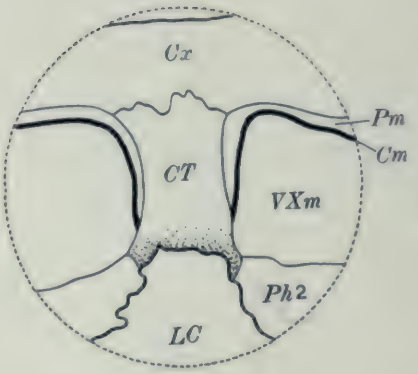

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Plate XLIV

Fig. 1. Portion of a pellet from the infrabuccal pocket of *Pachysima æthiops* (F. Smith), showing numerous spores and other plant material. × 180.

Fig. 2. *Barteria Dewevrei* De Wildeman and Durand. Transverse section of myrmecodomatium, showing lateral pit and hyperplasia: *LC*, lateral cavity; *Ph2*, thick-walled medullary tissue; *CT*, callus containing amber-colored, hyaline substance; *VXm*, vesselless xylem; *Cm*, cambium; *Pm*, phloem; *Cx*, cortex. × 60.

Fig. 3. Portion of a coccid (*Stictococcus formicarius* Newstead) taken from larval pellet of *Pachysima æthiops* (F. Smith). × 100.

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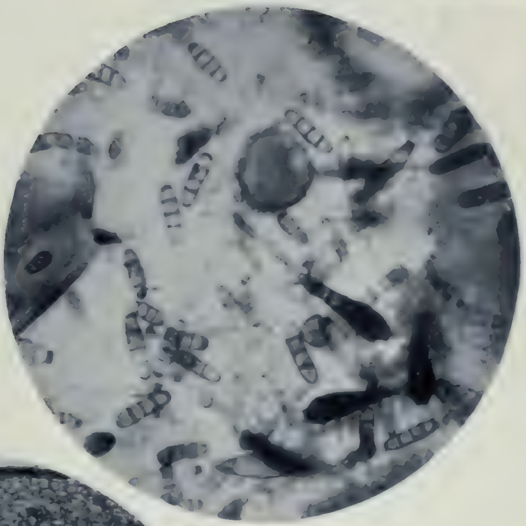

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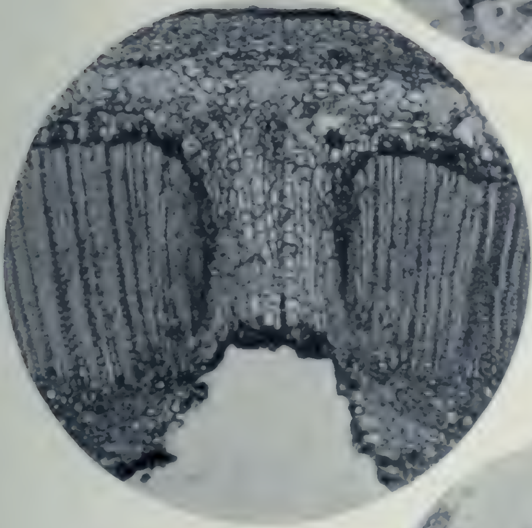

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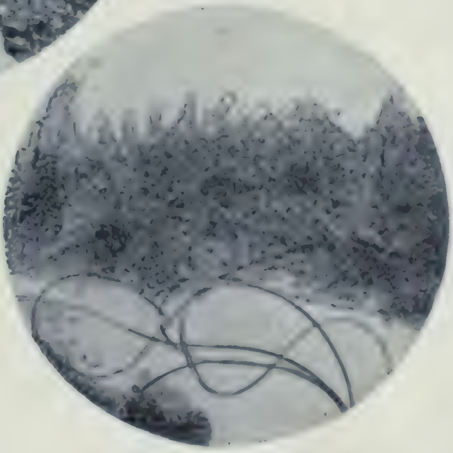


PLATE XLV

Fig. 1. Fragments of nutritive layer of heteroplasia in larval pellet of *Viticicola tessmanni* (Stitz). × 90.

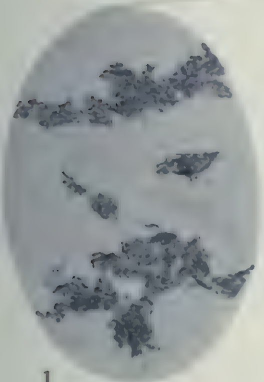
Fig. 2. Coccid larva (*Stictococcus formicarius* Newstead) from larval pellet of *Pachysima æthiops* (F. Smith). × 58.

Fig. 3. Fragment of ant larva from larval pellet of *Viticicola tessmanni* (Stitz). × 58.

Fig. 4. Portion of pellet of *Pseudomyrma gracilis* variety *mexicana*, showing numerous spores of different kinds. × 330.

Fig. 5. Portion of pellet of *Pachysima æthiops* (F. Smith), showing fragments of aërial hyphæ, spores, and other detritus. × 330.

Fig. 6. Portion of pellet of *Pachysima æthiops* (F. Smith), showing fragments of medullary tissue containing amber-colored substance. × 96.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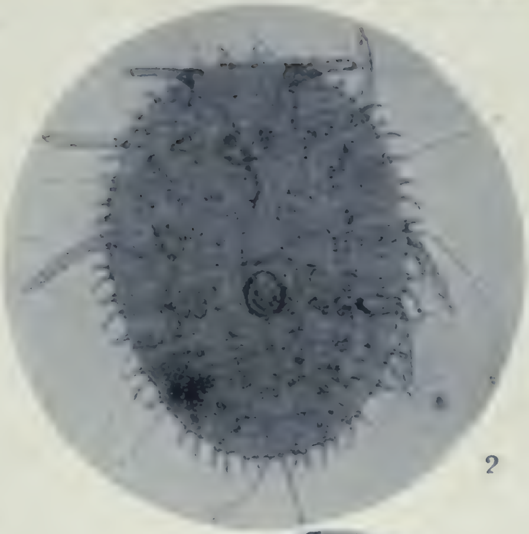
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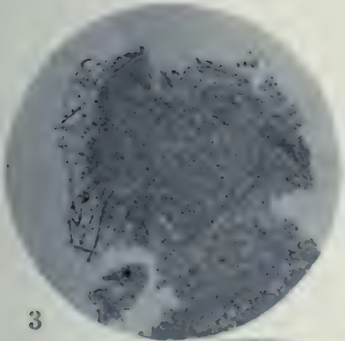
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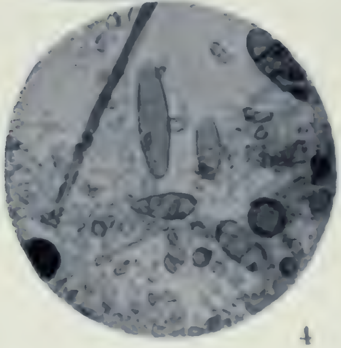
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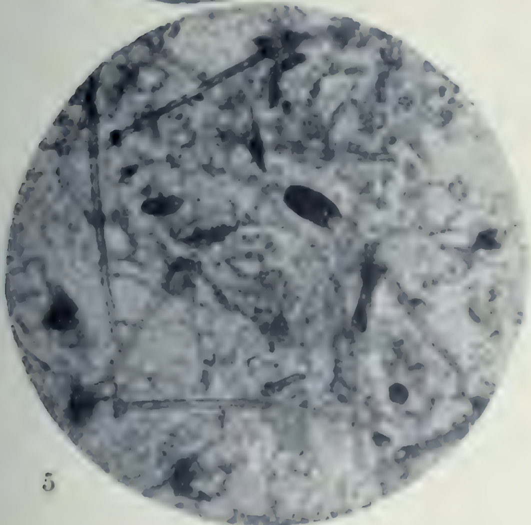
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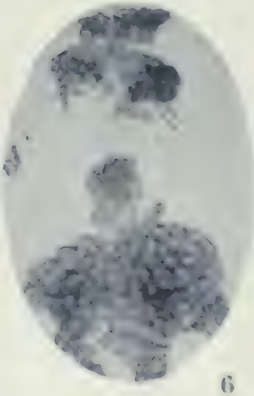
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VI.—NOTES ON A COLLECTION OF WEST AFRICAN MYRMECOPHILES

By Wm. M. Mann

Prof. Wheeler has kindly given me for study an interesting collection of West African myrmecophiles, most of them collected by the Rev. G. Schwab from nests of several species of *Dorylus* subgenus *Anomma*, some larvæ of *Microdon* taken by Messrs. Lang and Chapin, and two Paussidæ, not found with their host ant, collected by Dr. J. Bequaert and Messrs. Lang and Chapin.

Rev. G. Schwab had before sent quantities of material to Father E. Wasmann, who has recently written much on the guests of the doryline ants, increasing their number from fourteen species in 1900[1] to an extensive fauna, rich in highly specialized genera and species. Most of the species before me have been described by him. There is in the collection, however, an additional species of the interesting genus *Dorylophila* and a new variety of *Ocyplanus kohli* which I venture to describe.

Four specimens (one adult and three larvæ) of an aradid bug and the curious *Microdon* pupæ hereafter described were taken with *Pheidole megacephala* (Fabricius). The other species in the following list are guests of driver ants.

COLEOPTERA

Paussidæ

Pleuropterus lujæ (Wasmann)

Text Figure 101

Pleuropterus dohrni Wasmann, 1907, Deutsch. Ent. Zeitschr., p. 152, Pl. I, fig. 3 (♀) (*nec* fig. 4; *nec* Ritsema).

Pleuropterus dohrni subspecies *lujæ* Wasmann, 1907, Deutsch. Ent. Zeitschr., p. 152; 1910, Ann. Soc. Ent. Belgique, LIV, pp. 394 and 396.

Pleuropterus lujæ Wasmann, 1918, Tijdschr. v. Ent., LXI, p. 81.

Belgian Congo: Medje (Lang and Chapin).

The one specimen is without host ant. Originally described from Kondué, Kasai, also without indication of the host.

Paussus æthiops Westwood

Text Figure 102

Paussus æthiops Westwood, 1845, Arcana Ent., II, p. 186, Pl. XCIII, fig. 6. Blanchard, in Cuvier, Règne Animal, 3d Ed., Ins., Pl. LXI, fig. 8 (before 1845, but without description).

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[1] Wasmann, E. 1900. 'Neue Dorylinengäste aus dem neotropischen und dem äthiopischen Faunengebiet.' Zool. Jahrb. Abt. Syst., XIV, pp. 215-289, Pls. XIII-XIV.

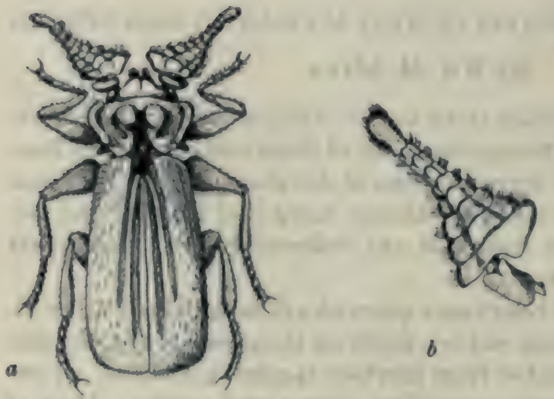

Fig. 101

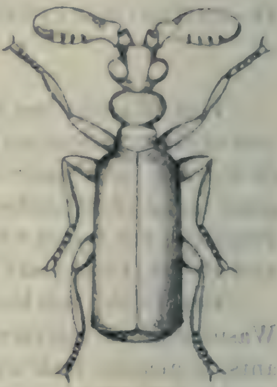

Fig. 102

Fig. 101. *Pleuropterus lujæ* (Wasmann): *a*, insect from above; *b*, antenna enlarged.
Fig. 102. *Paussus æthiops* Westwood: insect from above.

Belgian Congo: Between Beni and Kasindi (J. Bequaert).

"At Lisasa, a village in the Savannah of the Semliki Valley, about midway between Beni and Kasindi, a great many specimens of this *Paussus* were attracted by lights in the evening (August 12, 1914). When taken between the fingers these beetles would 'explode' in the same manner as bombardier-beetles (*Brachinus*, *Pheropsophus*, etc.). They emit at the same time a volatile substance with a strong odor of bromine which stains the skin brown." (J. Bequaert).

Staphylinidæ

Sympolemon anommatis Wasmann

Sympolemon anommatis Wasmann, 1900, Zool. Jahrb. Abt. Syst., XIV, p. 258; 1917, Zeitschr. Wiss. Zool., CXVII, p. 311, Pl. ix, fig. 30.

Cameroon: Akono-Linga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans sjæstedti* Emery.

Three specimens which agree closely with a cotype received from Father Wasmann. The species has been found with various *Doryli* in the Belgian Congo (Sankuru; St. Gabriel) and Cameroon (Grand Batanga; Yukaduma).

Mimanomma spectrum Wasmann

Mimanomma spectrum Wasmann, 1912, Zool. Anzeiger, XXXIX, p. 480, figs. 1–8; 1917, Zeitschr. Wiss. Zool., CXVII, p. 302, Pl. ix, fig. 27.

Cameroon: Akono-Linga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans sjæstedti* Emery.

Prof. Wheeler sends me the following notes in regard to this extraordinary dorylophile: "In conversation with Mr. Geo. Schwab I learned that, although he investigated as many as 1000 to 1200 marching armies of *Dorylus* and *Anomma* during his sojourn of many years in the Cameroon, he succeeded in finding *Mimanomma* only on two occasions. The first lot, comprising the types, was sent to Father Wasmann in two vials which led him to cite them erroneously as from two armies (Zool. Anzeiger, XXXIX, 1912, p. 473). The second lot, which Mr. Schwab sent to me, was taken with the same host (*Anomma nigricans* subspecies *sjœstedti*) about 60 miles farther inland and 30 miles north of Akono-Linga, August 19, 1916. The beetles walk in the *Anomma* files but more slowly than the ants. Mr. Schwab says he has never seen the ants either touching or paying the slightest attention to the *Mimanomma*. The same is true of the other staphylinids which are often very numerous in the processions or bring up the rear after the ants have passed. He states that the dorylophiles are most abundant in August and may be very scarce in the processions during the rainy season. He captured only such beetles as voluntarily and persistently returned to the ant-trail after they had been removed from it.

"Wasmann, in dealing with the ecitophiles of the Neotropical and the dorylophiles of the Ethiopian Region, has elaborated hypotheses of mimicry, hypertely, etc., to account for the ant-like appearance of some of these insects. *Mimanomma* he regards as a case of hypertely—one in which the insect has become an example of greatly and uselessly exaggerated mimicry of its host ('über das Ziel hinausschiessende Mimicry'). As it is rather important that such speculations, which are easily excogitated in laboratories and museums, should not be left in undisputed possession of the field of theoretical biology, I advance another hypothesis which seems to me worthy of consideration. It is well known that bivouacking dorylines, and especially the species of *Anomma*, form great masses, like swarming bees, with their long legs, antennæ and bodies interlaced and enveloping the brood, booty, and guests. Long, slender insects like *Mimanomma* and even those of Wasmann's 'Trutztypus,' which have the very opposite shape, being short and broadly rounded anteriorly, with rapidly tapering posterior end, would be beautifully adapted for forcing their way through and moving about in the forest of legs, antennæ and bodies of the bivouacking ants, much as both very thin, long, insinuating and small, round, pushing people seem to be better adapted for shouldering their way through a crowd than people of average stature. Hence, the peculiarities of form referred by Wasmann to mimicry, hypertely, etc. may be really direct and useful adaptations to the very peculiar nest environment created by the densely agglomerated bodies of their hosts. I have seen such conditions in ecitophile-containing artificial nests of our North American *Eciton (Acamatus) schmitti* Emery and *opacithorax* Emery, and have no doubt that future observers will be able to make similar observations on *Anomma* and its guests. Of course, *M. spectrum* is really 'phasmoid,' rather than 'ant-like'."

Dorylomimus brevicornis Wasmann

Dorylomimus brevicornis Wasmann, 1917, Zeitschr. Wiss. Zool., CXVII, p. 298.

Cameroon: Batanga (Schwab).

Host: *Dorylus (Anomma) nigricans burmeisteri* variety *rubellus* (Savage).

Originally taken from the columns of the same ant at St. Gabriel near Stanleyville. A single specimen before me agrees closely with the description of the type. It is very distinct from a cotype of *D. kohli* Wasmann in having the head shorter and broader and the antennæ shorter.

Dorylophila rotundicollis Wasmann

Dorylophila rotundicollis Wasmann, 1904, Zool. Jarhb. Abt. Syst., Suppl. VII, p. 633, Pl. xxxi, fig. 7.

Cameroon: Akono-Linga (Schwab).

Host: *Dorylus (Anomma) nigricans sjœstedti* Emery.

Several specimens in the collection agree closely with Wasmann's description and figure of this species, which was described from specimens taken with *Dorylus wilverthi* Emery in the Congo.

Dorylophila schwabi, new species

Length 2 mm.

Dark reddish brown, antennæ yellowish brown; very feebly shining; head, thorax, and elytra finely granulose-punctate and with a dense covering of short hairs; abdomen with fine, silky, semirecumbant hairs which are longest on the margins and apex.

Head broader than long, wider behind than in front, sides in back of eyes feebly convex and rounding into the feebly convex posterior border. Eyes a little more than half as long as sides of head, the surface a little convex. Antennæ stout, first joint as long as the second and third together, second and third joints elongate-cylindrical, the third shorter than the second, fourth joint slightly longer than broad, remaining joints transverse, becoming strongly so apically, terminal joint a little longer than the two preceding. Pronotum broader than long, with a strong semicircular impression at the posterior portion and the posterior two-thirds of sides;

middle of posterior border slightly produced and rounded; surface in front of semicircular impression convex, with a broad, shallow impression behind middle. Elytra at base a little broader than prothorax, broader behind than in front, sides and posterior border nearly straight, sides elevated into blunt margins, surface flat behind, elevated and feebly convex in front of middle. Abdomen narrow, about as long as remainder of body, at base a little narrower than the elytra, first five segments margined at sides.

Cameroon: Efulen to Elat (Schwab).

Host: *Dorylus (Anomma) nigricans burmeisteri* variety *rubellus* (Savage).

This is the second species in the genus and differs from *D. rotundicollis* Wasmann in its smaller size, more delicate punctation, in the broader and thicker antennal joints, and in not having the posterior corners of the elytra angulately projecting.

Ænictonia (Anommatonia) anommatophila Wasmann

Ænictonia anommatophila Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 636.

Ænictonia (Anommatonia) anommatophila Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 31, Pl. II, figs. 2, 2a–*b*.

Cameroon: Akono-Linga; Mful Aja (Schwab).

Host: *Dorylus (Anomma) nigricans sjæstedti* Emery.

Ænictonia (Anommatochara) rubella Wasmann

Ænictonia (Anommatochara) rubella Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 33, Pl. II, figs. 4, 5, and 5a.

Cameroon: Akono-Linga (Schwab).

Host: *Dorylus (Anomma) nigricans sjæstedti* Emery.

Ocyplanus kohli Wasmann[1] variety **niger**, new variety

Differing from the typical form (from nest of *Dorylus wilverthi* Emery) in color, being black, with the appendages brown and the apical portions of femora dark brown to black. The difference is constant in a series of thirty specimens before me, which apparently belong to a distinct variety.

Cameroon: Mful Aja (Schwab).

Host: *Dorylus (Anomma) nigricans sjæstedti* Emery.

Demera kohli Wasmann

Demera kohli Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 630.

Cameroon: Metit (Schwab).

Host: *Dorylus (Anomma) kohli* variety *congolensis* Santschi.

Several specimens, one of which has been compared with the type, are in the collection.

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[1] *Ocyplanus kohli* Wasmann, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, pp. 137 and 139, Pl. III, fig. 5.

Pygostenus bicolor Wasmann

Pygostenus bicolor WASMANN, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 647.

Cameroon: Batanga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans burmeisteri* variety *rubellus* (Savage).

One specimen.

Pygostenus lujæ Wasmann

Pygostenus lujæ WASMANN, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 648.

Cameroon: Batanga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans burmeisteri* variety *rubellus* (Savage).

Four specimens.

Pygostenus alutaceus Wasmann

Pygostenus alutaceus WASMANN, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 649.

Cameroon: Batanga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans burmeisteri* variety *rubellus* (Savage).

The single specimen in the collection runs in Wasmann's key and answers to the short description of this species, which was first taken with *D. wilverthi* Emery in Congo.

Phyllodinarda xenocephala Wasmann

Phyllodinarda xenocephala WASMANN, 1917, Zeitschr. Wiss. Zool., CXVII, p. 330, Pl. IX, figs. 35 and 36.

Cameroon: Akono-Linga (Schwab).

Host: *Dorylus* (*Anomma*) *nigricans sjæstedti* Emery.

Originally found with the same ant in Cameroon (Grand Batanga; Lolodorf).

DIPTERA

Syrphidæ

Microdon species

Text Figure 103

Larva. Length 6 to 7.5 mm.

Dark brown, opaque (except stigmal plates), granulose-punctate. Form broadly oval, convex above, concave beneath. Dorsum with a strong median longitudinal ridge extending from the posterior spiracle to anterior end and a series of seven similar transverse ridges which are interrupted at middle; these ridges thickly covered with coarse, conical spines, some of which appear to be composed of elongate flattened hairs; surface between ridges reticulate, the reticulæ made up of rows of clusters o

3 to 5 crystalline-like particles. Lateral margins with an interrupted, moderately coarse longitudinal ridge beneath which is a series of four fine parallel ridges and a membraneous margin. Posterior spiracle elongate, tubercular, dull grayish in color, stigmal plates shining, amber-colored, each divided into four stubby finger-like projections, two above and two below, above with two very large pores.

Congo: Zambi (Lang and Chapin).

Host: *Pheidole megacephala* (Fabricius).

Several specimens.

These pupæ are remarkable on account of the pronounced ridges on the upper surface and the structure of their bristles. The latter vary, those at the sides of the ridges being elongate, whitish flat hairs arranged in groups of 2 to 6; the others thick, conical, brown structures, seemingly composed of masses of hairs coalesced. Most of the conical spines are subequal in size but among them are a few much larger than the others. All have at the tips whitish particles which are somewhat glistening and may possibly be exudations.

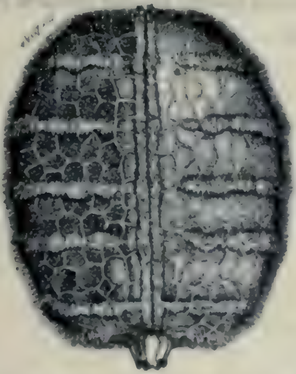

Fig. 103. *Microdon* species: larva living with *Pheidole megacephala* (Fabricius) at Zambi; from above.

HOMOPTERA

Coccidæ

The following scale insects were found in the domatia of various ant-plants collected by Lang, Chapin, and Bequaert in the Belgian Congo. They have been identified by Prof. R. Newstead, of the Liverpool School of Tropical Medicine. The three forms first enumerated are apparently still undescribed.

Pseudococcus citri (Risso) variety **congoënsis** Newstead

Taken from myrmecodomatia of *Barteria fistulosa* inhabited by *Pachysima æthiops* (F. Smith) at Medje (Lang and Chapin). Also from domatia of *Cuviera angolensis* inhabited by *Crematogaster africana* subspecies *laurenti* variety *zeta* (Forel) near Stanleyville (Lang and Chapin).

Pseudococcus crassipes Newstead

Taken from myrmecodomatia of *Sarcocephalus* species inhabited by *Crematogaster africana* subspecies *winkleri* variety *fickendeyi* (Forel) at Masongo, between Walikale and Lubutu (J. Bequaert).

Lecanium (Saissetia) barteriæ Newstead

Taken from hollow stems of *Barteria Dewevrei* inhabited by *Crematogaster africana* variety *schumanni* (Mayr) at Leopoldville (J. Bequaert).

Stictococcus formicarius Newstead

Stictococcus formicarius NEWSTEAD, 1910, Journ. Econ. Biol., V, p. 19, fig.

Larvæ of this species were recognized in the pellets taken from the trophothylax of larvæ of *Pachysima æthiops* (F. Smith) living in *Barteria fistulosa* at Medje (Lang and Chapin). This scale insect was described from specimens found in the hollow stems of *Barteria fistulosa* and *Cuviera angolensis*.

VII.—KEYS TO THE GENERA AND SUBGENERA OF ANTS

By Wm. M. Wheeler

Key to the Subfamilies[1]

☿, ♀

1. Cloacal orifice round, terminal, surrounded by a fringe of hairs; sting transformed into a sustentacular apparatus for the orifice of the poison vesicle, which has a peculiar structure called by Forel "pulviniferous vesicle" (*vessie à coussinet*). Abdominal pedicel consisting of a single segment; no constriction between the second and third segments. Male genitalia not retractile. Nymphs rarely naked, most frequently enclosed in a cocoon. FORMICINÆ.

Cloacal orifice in the shape of a slit .... 2.

2. Sting rudimentary (except *Aneuretus*); abdominal pedicel consisting of a single segment; no constriction between the second and third segments of the abdomen; the poison glands are often vestigial and there are anal glands which secrete an aromatic product of characteristic odor (*Tapinoma*-odor). Nymphs without a cocoon.......... DOLICHODERINÆ.

Sting developed, though sometimes very small, but capable nevertheless of being exserted from the abdomen. The first two segments of the abdomen usually modified, either forming together a two-jointed pedicel, or the first alone (petiole) forming the pedicel, the second (postpetiole) being merely constricted posteriorly and articulating with a spheroidal surface of the third segment, which is usually transversely striated (stridulatory organ); rarely the second segment is not appreciably modified.. 3.

3. Pedicel of two segments, the petiole and the postpetiole; rarely (in *Melissotarsus*, *e. g.*) the postpetiole is attached to the following segment over its whole extent. Frontal carinæ usually separated from each other (except in the Melissotarsini and certain Attini). In the male the copulatory organs are almost always exserted (being entirely retractile in certain genera of the Solenopsidini only); cerci nearly always present (except *Anergates*). Nymphs naked .... 4.

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[1] Wheeler, Wm. M. 1920. 'The subfamilies of Formicidæ, and other taxonomic notes.' Psyche, XXVII, pp. 46–55.

Pedicel consisting of a single segment, more rarely of two, but in this case the frontal carinæ are very close to each other and do not cover the insertions of the antennæ (Dorylinæ) or the mandibles are linear and denticulate (*Myrmecia*)..........5.

4. Clypeus not prolonged back between the frontal carinæ (in some species of *Pseudomyrma* there is an apparent prolongation which, however, is the equivalent of the frontal area and is often separated from the clypeus), its posterior margin rounded. Median spurs of middle and hind tibiæ pectinate. Ocelli almost always developed in the worker. Antennæ 12-jointed in worker, female, and male. Fore wings with two closed cubital cells, rarely with one. Larvæ hypocephalic and with a trophothylax; the thoracic and first abdominal segments furnished with peculiar exudatory papillæ (*exudatoria*) which form a cluster around the mouth.
PSEUDOMYRMINÆ.

Clypeus almost always prolonged between the frontal carinæ; if not, the spurs of the middle and hind tibiæ are simple or absent, or the antennæ are 11-jointed in worker and female, 12-jointed in the male and the fore wings have one closed cubital cell. Larvæ orthocephalic, without exudatoria around the mouth.
MYRMICINÆ.

5. Frontal carinæ very close to each other, almost vertical, not at all covering the antennal insertions; abdominal pedicel of one or two segments. In the male the genitalia are completely retractile (except in *Leptanilla*) and the subgenital lamina is usually (if not always) furcate; cerci absent. Nymphs usually naked (eyes and ocelli absent in the ☿ of all African genera).
DORYLINÆ.

Frontal carinæ separated or close together; in the latter case they are dilated anteriorly to form an oblique or horizontal lamina, covering in part the insertion of the antennæ; abdominal pedicel of a single segment (except *Myrmecia*). Copulatory organs of the male incompletely retractile; subgenital lamina never furcate (except in *Paraponera*); cerci nearly always present. Nymphs usually enveloped in a cocoon (eyes present in the ☿ of most African genera).
CERAPACHYINÆ and PONERINÆ.

DORYLINÆ Leach

Key to the Tribes

1. Worker and Soldier: pygidium tridentate, with a median impression; maxillary and labial palpi 2-jointed; cheeks without a longitudinal carina; first abdominal segment not separated from the second by a constriction. Female: cloaca open, leaving the sting uncovered; hypopygium forked and extending considerably beyond the pygidium; thorax unsegmented. Male: pterostigma of fore wing very elongate and narrow; radial cell open and elongate, one closed cubital cell; genital armature retractile. . . . . DORYLINI Forel.

Worker and Soldier: pygidium simple; maxillary palpi 2- or 3-jointed, labial palpi 2-jointed; cheeks longitudinally carinate; a constriction usually separates the second and third abdominal segments, making the petiole 2-jointed. Female: cloaca covered by the pygidium; hypopygium not considerably extended. Male: pterostigma of fore wing broad or narrow; radial cell elongate, one or two closed cubital cells; genital armature retractile. . . . . ECITONINI Forel.

Worker: pygidium simple; maxillary and labial palpi 1-jointed; cheeks not carinate; petiole 2-jointed. Female: cloaca open, leaving the sting uncovered; hypopygium lobed and extending beyond the pygidium; thorax with a suture behind the anterior pair of legs, which is effaced on the dorsum. Male: fore wings without pterostigma or nervures. Genital armature extended, not retractile. . . . . LEPTANILLINI Emery.

1. Dorylini Forel

Dorylus Fabricius. (Ethiopian, North Africa, the Mediterranean coast of Asia Minor, Indomalayan, Papuan).

☿, ♀

a. Antennæ 12-jointed in the soldier and in the large- and medium-sized worker. (Indomalayan). . . . . Subgenus **Dichthadia** Gerstæcker

Antennæ 9-jointed. (Ethiopian, North Africa, Indomalayan, Papuan). Subgenus **Alaopone** Emery.

Antennæ 11- or 10-jointed. . . . . *b.*

b. Pygidium with a semicircular impression, the margins of which are sharp Antennæ 11-jointed. . . . . *c.*

The impressed area of the pygidium without distinct margins . . . . *d.*

c. Antennæ short and thick; all the joints of the funiculus, except the last, much wider than long. (Ethiopian) . . . . **Dorylus**, *sensu stricto*

Antennæ elongate; at least some of the joints of the funiculus longer than wide. (Ethiopian)............Subgenus **Anomma** Shuckard.

d. Subapical tooth of mandibles simple; antennæ 11-jointed; worker major 13 mm. long. (Same distribution as the genus).
Subgenus **Typhlopone** Westwood.

Subapical tooth of mandibles double, or truncate; worker major 8 mm. long. (Ethiopian)...............Subgenus **Rhogmus** Shuckard.

♀

The female of *Typhlopone* Westwood is unknown.

a. Antennæ 12-jointed...............Subgenus **Dichthadia** Gerstæcker.

Antennæ 11-jointed..*b.*

b. Hypopygium having the shape of a cleft plate which is narrowed behind.
Subgenus **Dorylus**, *sensu stricto.*
" **Anomma** Shuckard.
" **Rhogmus** Shuckard.

Hypopygium wide, forming two lobes which are divergent behind.
Subgenus **Alaopone** Emery.

♂

a. Mandibles wide at the base and prolonged into a point, with the inner margin deeply excised...........Subgenus **Dichthadia** Gerstæcker.

Mandibles shaped differently..................................*b.*

b. Petiole wider than long, its posterior face concavely excavated........*c.*

Petiole nearly square, or round................................*d.*

c. Mandibles less than 4 times as long as wide.
Subgenus **Dorylus**, *sensu stricto.*

Mandibles more than 4 times as long as wide.
Subgenus **Anomma** Shuckard.

d. Mandibles about 3 times longer than wide.
Subgenus **Typhlopone** Westwood.

Mandibles much shorter..*e.*

e. Wings with a second recurrent nervure...Subgenus **Rhogmus** Shuckard.

Wings without a second recurrent nervure..Subgenus **Alaopone** Emery.

2. **Ecitonini** Forel

The female of *Cheliomyrmex* and the worker and female of *Ænictogiton* are unknown.

☿, ♃

1. Antennæ 10-jointed. No vestiges of eyes. (Ethiopian, North Africa, Indomalayan, Papuan, northeast Australia).
Ænictus Shuckard.

Antennæ 12-jointed..2.

2. Pedicel composed of one segment, the postpetiole not sharply separated from the gaster by a constriction. Eyes vestigial. Claws with a median tooth. (Neotropical).[1]
Cheliomyrmex Mayr.

Pedicel composed of two segments. Eyes present or absent. Claws simple or with a median tooth. (Neotropical, except the Antilles and Chile; central and southern United States).
Eciton Latreille.

a. Claws simple .... Subgenus **Acamatus** Emery.
Claws with a distinct median tooth .... *b*.

b. First joint of the funiculus at most half the length of the second. Head with a more or less curved spine on each side at the occipital angle. Eyes distinct. Soldier with hook-shaped mandibles (*E. rapax* has no soldier) .... Subgenus **Eciton**, *sensu stricto*.
First joint of the funiculus more than half the length of the second. Head without spines or at most with a simple, straight spine at the occipital angle. Mandibles of the soldier not hook-shaped.
Subgenus **Labidus** Jurine.

♀

1. Antennæ 10-jointed .... **Ænictus** Shuckard.
Antennæ 12-jointed .... **Eciton** Latreille.

a. Claws simple .... Subgenus **Acamatus** Emery.
Claws with a distinct median tooth .... *b*.

b. Epinotum and petiole above with a pair of blunt, horn-like projections.
Subgenus **Eciton**, *sensu stricto*.
Epinotum and petiole above without projections. Subgenus **Labidus** Jurine.

♂

1. Pterostigma of fore wing narrow; radial cell closed; two closed cubital cells .... 2.
Pterostigma of fore wing broad; radial cell open .... 3.

2. Mandibles very long, slender, and falcate, with a peculiar cluster of short, erect hairs at the base on the inner side; subgenital plate with four apical teeth; hind femora distinctly flattened.
Cheliomyrmex Mayr.

Mandibles shorter and of a different shape, or if of the same shape then without the peculiar cluster of hairs; subgenital plate with three apical teeth; hind femora not or only feebly flattened.
Eciton Latreille.

a. Legs short, the hind femur not reaching the hind margin of the second segment of the gaster; head narrow; thorax hump-backed, much raised above the head .... Subgenus **Acamatus** Emery.

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[1] I have recently placed *Cheliomyrmex* in an independent tribe, the Cheliomyrmicini.

Legs long, the hind femur reaching to or beyond the hind margin of the second segment of the gaster; head large, the thorax moderately inflated .....Subgenera **Eciton**, *sensu stricto* and **Labidus** Jurine.

3. Two closed cubital cells. Thorax long and narrow; scutellum not prominent. Legs short and thick; tibiæ with a long spur (Congo)............................**Ænictogiton** Emery.

One closed cubital cell. Thorax with the mesonotum much raised above the pronotum; scutellum prominent. Legs usually slender; tibiæ with a rudimentary spur..**Ænictus** Shuckard.

3. **Leptanillini** Emery

Leptanilla Emery. (Corsica, Sardinia, Barbary, Singapore, and Borneo).

CERAPACHYINÆ Forel and **PONERINÆ** Lepeletier

Key to the Tribes[1]

☿, ♀

1. Claws pectinate. Mandibles articulated near the anterior angles of the head. Constriction behind the postpetiole feebly marked. LEPTOGENYINI Forel.

Claws simple or toothed; in certain *Simopone* pectinate, but in these the postpetiole is separated by a strong constriction behind...2.

2. Mandibles articulated to the middle of the anterior margin of the head, when closed placed parallel to each other in front of the clypeus; when opened they lie in a straight line parallel to the anterior margin of the head. Postpetiole not separated by a constriction behind................ODONTOMACHINI Mayr.

Mandibles articulated to the anterior angles of the head........3.

3. Postpetiole narrower than the following segment, forming with the petiole a two-jointed pedicel. Mandibles linear, very long. Antennæ 12-jointed. Claws toothed. Metanotum developed dorsally, between the mesoscutellum and the epinotum. MYRMECIINI Emery.

Not having all these characters..............................4.

4. Head flattened, much as in *Dorylus*: the face with two deep and broad antennal fossæ below, in which the antennæ are inserted close together, just above the short and obtuse clypeus. Frontal carinæ very approximate. Eyes absent. Mandibles

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[1] For the convenience of identification of specimens the tribes of the Cerapachyinæ and Ponerinæ have been united in one key.

narrow, with three apical teeth. Antennæ 11-jointed, their funiculus much thickened. Postpetiole very feebly constricted behind. Female unknown . . DORYLOZELINI, new tribe.

Head of the usual Ponerine shape. Not with all these characters..5.

5. Face on each side with a scrobe which extends to the hind margin of the head and is recurved behind the eye, so that it can take the scape and funiculus of the antenna. Mandibles triangular, robust. Antennæ 12-jointed. Petiole with a ventral spine near its base; postpetiole separated by a constriction behind. Claws toothed. . . . . PARAPONERINI Emery.

Facial scrobes usually absent; when feebly marked (as in *Acanthoponera* and *Prodiscothyrea*) they never extend behind the eyes; but the frontal carinæ often take up the base of the scape. In *Paranomopone* a deep facial scrobe on each side in front of the eye accommodates scape and funiculus. . . . . 6.

6. At least one ocellus in the worker. Body of worker and female elongate, cylindrical; pygidium impressed, armed at the sides with several stumpy spines (female as far as known winged). Antennæ 12-jointed . . . . CYLINDROMYRMICINI Emery.

Usually no ocellus in the worker . . . . 7.

7. Petiole depressed, articulated over its whole width with the postpetiole. Antennæ 12-jointed. . . . . 8.

Articulation between the petiole and postpetiole narrow; if broader (as in *Prionopelta*) the hind tibiæ have one or no spur and the pygidium is not bordered by a row of small spines . . . . 9.

8. Two spurs on the hind tibiæ. Mandibles narrow. Thorax with distinct sutures in the worker; the metanotum not developed dorsally. Pygidium not bordered by spines.

AMBLYOPONINI Forel.

Tibiæ with a single, broad, pectinate spur. Mandibles in the worker subtriangular. Thorax without distinct sutures. Pygidium impressed, with a lateral row of spines in the worker.

ACANTHOSTICHINI Emery.

9. Insertion of the antennæ nearer the sides than the middle line of the head. Mandibles narrow, arcuate, with spiniform teeth. Antennæ 12-jointed. Petiole with a high scale above; constriction behind the postpetiole indistinct. Claws simple.

THAUMATOMYRMICINI Emery.

Not having all these characters ....10.

10. Insertion of the antennæ exposed ....11.

Insertion of the antennæ at least partly covered by the frontal carinæ. In *Ophthalmopone* almost exposed ....12.

11. Gaster strongly reflexed ventrally, or if not (as in *Probolomyrmex* and *Escherichia*) the frontal carinæ are fused together and with the clypeus. Mandibles subtriangular. Antennæ 9-, 10- or 12-jointed. Tibiæ with one or no spur. Claws simple. PROCERATIINI Emery.

Gaster straight. Frontal carinæ distinct from each other. Antennal fossa margined by lateral carinæ of the cheeks. CERAPACHYINI Forel.

12. Frontal carinæ remote, more or less parallel, or feebly diverging behind, without lateral lobe (except in the Neotropical genus *Alfaria*) ....ECTATOMMINI Emery.

Frontal carinæ with a lateral lobe ....13.

13. Insertion of the antennæ approximated; the frontal carinæ usually converging behind the lobe ....14.

Insertions of the antennæ remote. Clypeus flat. The body entirely covered with a very fine pruinose pubescence. Mandibles subtriangular. Antennæ 12-jointed. Middle and hind tibiæ with two spurs. Claws toothed. PLATYTHYREINI Emery.

14. Middle and hind tibiæ without spurs. Legs very long. Claws very large, simple. Clypeus short, its anterior margin arcuate, with little teeth. Mandibles elongate, narrow at the base, broadened toward the middle, with small, unequal teeth along their inner margin. Eyes small. Antennæ 12-jointed, filiform. Female ergatoid..............ONYCHOMYRMICINI Ashmead.

Middle and hind tibiæ with one or two spurs. Antennæ 12-jointed. PONERINI Forel.

CERAPACHYINÆ Forel

1. Cerapachyini Forel

In a recent paper on the Australian members of this tribe[1] I have followed Ern. André in restricting *Sphinctomyrmex* Mayr to the genotype *S. ståli* Mayr, from South America; that species is only known by the female and the genus is therefore not included in the following key. This

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[1] Wheeler, Wm. M. 1918. 'The Australian ants of the ponerine tribe Cerapachyini.' Proc. American Acad. Arts Sciences, LIII, pp. 215–265.

female has the segments of the gaster separated by constrictions; but the eyes are well developed; the thorax has distinct sclerites and was probably winged; the antennæ are 12-jointed and the pygidium is emarginate. Santschi refers certain African male ants to *Sphinctomyrmex*, but it is very improbable that they correctly belong there; and the same remark applies to the male he describes as *Lioponera*.

☿

1. Gaster elongate, cylindrical, the segments separated from each other by pronounced constrictions. Female as far as known ergatomorphic or dichthadiiform, wingless and without distinct sutures on the dorsal face of thorax. (Indomalayan, Papuan, Australian)..................**Eusphinctus** Emery.
    a. Antennæ 11-jointed in worker and female.
        Subgenus **Eusphinctus**, *sensu stricto*.
    Antennæ 12-jointed in worker and female........................*b.*
    b. Worker with well-developed eyes and emarginate pygidium. Large, black species..................Subgenus **Zasphinctus** Wheeler.
    Worker eyeless or with very minute eyes. Pygidium entire. Smaller, ferruginous or yellow species....Subgenus **Nothosphinctus** Wheeler.

    Segments of the gaster not thus separated......................2.

2. Last antennal joint much thicker and larger than the preceding joint, forming a one-jointed club. Petiole not marginate on the sides. (Syria, Ethiopian, Malagasy, Indomalayan, Papuan, Australian, Neotropical, Texas).
    Cerapachys F. Smith.
    a. Antennæ 12-jointed..........Subgenus **Cerapachys**, *sensu stricto*.
    Antennæ 11-jointed..........Subgenus **Parasyscia** Emery.
    Antennæ 10-jointed..........Subgenus **Ooceræa** Roger.
    Antennæ 9-jointed..........Subgenus **Syscia** Roger.

    Last antennal joint not enlarged, though longer than the preceding joint, and not forming a distinct club...............3.

3. Funiculus of antenna terminating in a 4-jointed club. (Indomalayan and Australian; Ethiopian and North African species doubtful)..........................**Lioponera** Mayr.

    Funiculus not terminating in a 4-jointed club. Petiole marginate on sides. (Ethiopian, Malagasy, Indomalayan, Papuan, and Australian)...................**Phyracaces** Emery.

2. **Acanthostichini** Emery

Acanthostichus Mayr. (Neotropical and Texas).

a. Female wingless, dichthadiiform; eyes small, flattened; ocelli replaced by three depressions. Male rather stout, with short and thickened antennæ; thorax without Mayrian furrows. Worker known, with the characters given in the key to the tribes.
Subgenus **Acanthostichus**, *sensu stricto.*

Female winged and slender, with lengthened, cylindric gaster; eyes and ocelli well developed. Male rather slender, with slender antennæ; thorax with well-developed Mayrian furrows. Worker unknown.
Subgenus **Ctenopyga** Ashmead.

PONERINÆ Lepeletier

1. **Cylindromyrmicini** Emery

☿

1. Antennæ 12-jointed. Middle and hind tibiæ with two spurs. Claws simple. Female winged, similar to the worker. (Neotropical) . . . . **Cylindromyrmex** Mayr.

Antennæ 11-jointed. Tibiæ with a single, pectinate spur. Claws toothed or pectinate. Female unknown. (Ethiopian, Malagasy) . . . . **Simopone** Forel.

2. **Myrmeciini** Emery

Myrmecia Fabricius. (Australia, Tasmania; one species described from New Caledonia doubtfully belongs here).

a. Worker: mandibles short and broad. Scape not extending beyond three quarters of the length of the head. Female and male unknown.
Subgenus **Promyrmecia** Emery.

Mandibles long and narrow. Scape almost reaching to or even extending beyond the occipital margin of the head . . . . *b.*

b. Worker and female: mandibles with a long, recurved apical tooth, and unequal teeth along the inner margin.
Subgenus **Myrmecia**, *sensu stricto.*

Worker and female: mandibles linear, always straight and serrate. Male unknown . . . . Subgenus **Pristomyrmecia** Emery.

3. **Amblyoponini** Forel

☿, ♀

The female, where known, is winged.

1. Mandibles blunt at the apex, with two teeth-rows on their inner margin. Clypeus denticulate along the anterior margin. Frontal carinæ remote. Eyes present, but very small. Sculpture coarse. (Malagasy, Ethiopian, Indomalayan).
Mystrium Roger.

Mandibles pointed . . . . 2.

2. Anterior margin of the clypeus arcuate and as a rule denticulate. Antennæ slender, not club-shaped. Eyes usually small. Teeth on the inner margin of the mandibles partly in two rows. Integument partly dull. (Mediterranean, Nearctic, Neotropical, Indomalayan, Papuan, New Zealand). **Stigmatomma** Roger.

a. **Frontal lobes approximate. (Papuan).** Subgenus **Fulakora** Mann. (Type: *S.* (*Fulakora*) *celata* Mann).

Frontal lobes widely separated . . . . Subgenus **Stigmatomma**, *sensu stricto.*

Anterior margin of the clypeus without teeth, often straight or emarginate. Middle teeth of the mandibles in one row. Integument smooth and shining. . . . . .3.

3. Funiculus club-shaped, short and thick, slightly flattened. Eyes small. (Indomalayan, Papuan, Australian). **Myopopone** Roger.

Funiculus slender, filiform, hardly thickened toward the apex. . .4.

4. Frontal carinæ remote. Inner margin of the mandibles with a few teeth. Eyes very small. (Australian, Papuan, New Zealand) . . . . **Amblyopone** Erichson.

Frontal carinæ apparently more approximate. Mandibles denticulate along the entire inner margin. Clypeus produced into a rectangular lobe. Eyes absent or vestigial. Female unknown. (Ethiopian) . . . . **Xymmer** (Santschi).

♂

The male of *Amblyopone* is imperfectly described; that of *Xymmer* is unknown.

1. Frontal carinæ distinct. No cerci. Middle tibiæ with two spurs. **Mystrium** Roger.

Frontal carinæ vestigial. Cerci developed . . . . .2.

2. Integument dull. Middle tibiæ with one spur. **Stigmatomma** Roger.

Integument smooth and shining. Middle tibiæ with two spurs (generic identity still doubtful). . . . . **Myopopone** Roger.

4. **Paraponerini** Emery

Paraponera F. Smith. (Neotropical).

5. **Platythyreini** Emery

Platythyrea Roger. (Tropicopolitan).

6. **Ectatommini** Emery

☿ (♀ when known)

1. Worker: face on each side with a deep scrobe in front of the eye; this scrobe incompletely divided by a longitudinal ridge into two compartments, one for the accommodation of the scape and one for the funiculus. Antennæ ending in an indistinct, 3-jointed club. Claws simple. Female ergatoid, with one ocellus. (Australian)............**Paranomopone** Wheeler.

   Face without deep scrobes to accommodate the whole of the antennæ..2.

2. Antennæ ending in a 3- or 4-jointed club. Claws simple. Female winged, with eyes and ocelli............................3.

   Antennæ not ending in a distinct club. Claws as a rule toothed or bifid..5.

3. Articulation of petiole and postpetiole not remarkably narrower than the postpetiole (as in the Amblyoponini). Middle and hind tibiæ with one spur. (Neotropical, Indomalayan. Papuan)..............................**Prionopelta** Mayr.

   Articulation of petiole and postpetiole much narrowed, as usual in this tribe..4.

4. Petiole distinctly narrowed into a peduncle at the base. (Neotropical)..........................**Typhlomyrmex** Mayr.

   Petiole not pedunculate at the base. (Borneo, Papuan, Neotropical)..........................**Rhopalopone** Emery.

5. Basal segment of the gaster strongly curved or vaulted dorsally, so that its hind part is directed downward or even anteriorly..6.

   Basal segment of the gaster of normal shape.................8.

6. Thorax with pronounced promesonotal and mesoëpinotal sutures. Eyes normally developed. Basal segment of the gaster moderately vaulted. Petiole with a basal spine ventrally; postpetiole also with a ventral, flattened tooth, directed anteriorly. Female and male unknown. (Papuan).

   Wheeleripone Mann. (Type: *Wheeleripone albiclara* Mann).

   Thorax of the worker without traces of sutures dorsally..........7.

7. Eyes of the worker small. Basal segment of the gaster very strongly curved. Female winged, with two closed cubital cells, or ergatoid. (Neotropical).....................**Alfaria** Emery.

   Eyes of the worker larger. Basal segment of the gaster more feebly curved. Female winged, with one closed cubital cell. (Indomalayan. Papuan)...................**Stictoponera** Mayr.

8. Antennal fossæ extending backward above the eyes. Epinotum with teeth or spines. Promesonotal suture very distinct in the worker. Posterior coxæ unarmed. (Neotropical, Australian, New Zealand; including *Heteroponera* Mayr).
Acanthoponera Mayr.

Antennal fossæ short or indistinct, as usual..................9.

9. Promesonotal suture very distinct in the worker; often mobile, or at least interrupting the striation......................10.

Promesonotal suture entirely obsolete, or impressed but not interrupting the sculpture..................................12.

10. Posterior coxæ armed with a spine. Female winged, with one closed cubital cell. (Neotropical).....**Holcoponera** Mayr.

Posterior coxæ unarmed. Female ergatoid or winged with two closed cubital cells....................................11.

11. Worker: small; first joint of the funiculus very little shorter or even longer than the second; the latter as a rule less than twice as long as thick. Spurs of the middle and hind tibiæ sinuate and broadly pectinate. Female winged. (Indomalayan, Papuan, Australian)...............**Chalcoponera** Emery.

Worker: larger; first joint of the funiculus distinctly shorter than the second; the latter slender, at least twice as long as thick. Spurs of the middle and hind tibiæ straight or feebly sinuate, shortly pectinate. Female unknown, probably highly ergatoid. (Australian, Papuan)......**Rhytidoponera** Mayr.

12. Worker: mandibles long and narrow, obliquely truncated at the tip, denticulate along the inner margin. Female unknown. (Haiti).................................**Emeryella** Forel.

Worker: mandibles triangular or linear, but not toothed along the inner (basal) margin. Female when known, winged, with two closed cubital cells. (Neotropical, Texas).
Ectatomma F. Smith.

a. Clypeus on each side with a tuberculate swelling covering the insertions of the antennæ; mandibles triangular. Posterior coxæ unarmed.
Subgenus **Ectatomma**, *sensu stricto*.

Clypeus not swollen above the insertions of the antennæ. Posterior coxæ as a rule with a spine.............................*b*.

b. Epinotum with a pair of long spines   Subgenus **Poneracantha** Emery.

Epinotum unarmed or at most with short teeth......................*c*.

c. Mandibles triangular; the apical margin denticulate and separated from the inner or basal margin by an angle.
Subgenus **Parectatomma** Emery.

Mandibles narrow and more or less linear; the inner or basal margin curves gradually into the apical margin which is not denticulate.
Subgenus **Gnamptogenys** Roger.

♂

The male of *Paranomopone* and *Rhopalopone* is unknown; that of *Alfaria* is doubtful.

1. Antennal scape much longer than the two following joints together. One closed cubital cell................................2.
Antennal scape not longer than the third joint or if longer, wings with two closed cubital cells................................3.
2. Articulation of the petiole and postpetiole not remarkably narrower than the postpetiole................**Prionopelta** Mayr.
Articulation of petiole and postpetiole as usual, much narrowed.
Typhlomyrmex Mayr.
3. Two closed cubital cells................................4.
One closed cubital cell................................5.
4. Scape as long as or longer than the second joint of the funiculus. Mayrian furrows on the mesonotum feeble or indistinct.
Rhytidoponera Mayr.
Scape shorter than the second joint of the funiculus. Mayrian furrows pronounced..................**Chalcoponera** Emery.
Ectatomma F. Smith.
Emeryella Forel.
?**Alfaria** Emery.
5. Sculpture of fine, close striæ. Petiole short, thickened behind into a node..............................**Holcoponera** Mayr.
Sculpture of coarse foveolæ, sometimes confluent. Petiole elongate, not swollen into a node..............**Stictoponera** Mayr.

7. **Thaumatomyrmicini** Emery

Thaumatomyrmex Mayr. (Neotropical).

8. **Proceratiini** Emery

☿ (♀ when known)

1. Clypeus separated by a distinct suture from the front, cheeks and frontal carinæ. Antennæ 12-jointed..................2.
Clypeus fused with the cheeks and frontal carinæ, the whole forming a plate projecting out over the mandibles; the antennæ are inserted close to the anterior margin of this structure....4.

2. Anterior margin of the clypeus projecting in the middle. Thorax without dorsal sutures. Petiole more or less nodiform. Female winged. (Ethiopian, Mediterranean, Japan, Nearctic, Neotropical) . . . . **Sysphincta** Roger.

   Anterior margin of the clypeus not projecting in front . . . . 3.

3. Dorsal sutures of the thorax faint or absent. Petiole scale-like. Antennæ not ending in a club. Female winged. (Nearctic, Indomalayan, Papuan) . . . . **Proceratium** Roger.

   Thorax with distinct promesonotal and mesoëpinotal sutures. Petiole decidedly transverse, less squamiform, the anterior surface being flattened. Funiculus ending in a distinct, 3-jointed club. Female unknown. (Haiti).
   Spaniopone Wheeler and Mann.

4. Antennæ 12-jointed . . . . 5.

   Antennæ 9- or 10-jointed. Basal segment of the gaster vaulted, the remaining segments forming an anteriorly directed cone. Thorax without dorsal sutures . . . . 7.

5. Basal segment of the gaster vaulted, the remaining segments forming an anteriorly directed cone. Eyes present. Dorsal sutures of the thorax faint or absent. Female unknown. (South Africa) . . . . **Pseudosphincta** Arnold.

   Segments of the gaster straight, directed posteriorly . . . . 6.

6. Eyes present, very small. Thorax with obsolete promesonotal and distinct mesoëpinotal sutures. (Ethiopian).
   Escherichia Forel.

   Eyes absent. Thorax without dorsal sutures. Female unknown. (South Africa) . . . . **Probolomyrmex** Mayr.

7. Antennæ 9-jointed. Clypeus forming a semicircular disc. Frontal carinæ small and short. Face without lateral depressions for the antennal scape. Female winged. (Nearctic, Ethiopian, New Zealand, Indonesian, Java, Papuan).
   Discothyrea Roger.

   Antennæ 10-jointed. Clypeus forming a very short, transverse plate. Frontal carinæ large, the face deeply and broadly excavated at their sides, forming scrobes for the accommodation of the antennal scape. Female winged. (Australian, Indomalayan) . . . . **Prodiscothyrea** Wheeler.

♂

Known only for two genera.

1. Frontal carinæ not fused with each other. Wings with one closed cubital cell . . . . **Sysphincta** Roger.

Frontal carinæ fused with each other. Wings with one closed cubital cell .... **Discothyrea** Roger.

9. **Dorylozelini**, new tribe

Dorylozelus Forel. (Australian). ♂ unknown.

10. **Ponerini** Forel

☿

1. Middle and hind tibiæ with two spurs .... 2.
Middle and hind tibiæ with a single, well-developed spur, which is always pectinate; the lateral spur rudimentary or absent ... 19.
2. The two spurs of the middle tibiæ simple, small. Median spur of the hind tibiæ pectinate, the lateral one simple. Mandibles elongate subtriangular, curved downward. Eyes absent. Antennæ thickened. Petiole with a ventral tooth. Female winged and with eyes and ocelli. (Neotropical, Indomalayan, Ethiopian) .... **Centromyrmex** Mayr.
Median spur of both middle and hind tibiæ well developed, pectinate. Eyes usually present (in *Pseudoponera* very small or absent) .... 3.
3. Mandibles narrow, converging near the base where they are provided with a strong tooth beneath; in front of this tooth they are projecting into a beak. Eyes very large, placed near the base of the mandibles. Antennæ filiform. Claws bifid. Female winged. (Indomalayan) ..... **Harpegnathos** Jerdon.
Mandibles of normal shape .... 4.
4. Anterior margin of the clypeus arcuate, with numerous denticulations. Antennæ filiform. Pronotum with two spines on its anterior margin. Claws simple. Female winged. (Indomalayan, Papuan) .... **Odontoponera** Mayr.
Anterior margin of the clypeus unarmed or with two teeth ...... 5.
5. Node of the petiole compressed above and forming a sharp edge, with a slight notch behind followed by a terminal blunt tooth. Antennæ filiform. Anterior margin of the clypeus emarginate, on each side with an obtuse tooth. Claws simple. Female unknown. (South Africa) .... **Streblognathus** Mayr.
Petiole shaped differently .... 6.
6. Clypeus with a median, raised portion, produced in front. Female winged .... 7.
Clypeus without a raised, projecting, median area .... 9.

7. Female: wings with three closed cubital, two discoidal and two submedian cells, one of the latter very small. Raised portion of the clypeus excavated in the middle and bordered by lateral ridges. Postpetiole without ventral tooth at the base. Middle tibiæ and metatarsi furnished above with rows of spines. Worker unknown. (Ethiopian)........... **Glyphopone** Forel.

Female: wings with two closed cubital, two discoidal, and one submedian cells..8.

8. Female: median area of the clypeus moderately raised, convex, slightly produced in front, hardly carinate on the sides, almost flat or very shallowly concave in the middle. Middle tibiæ and metatarsi furnished with rows of spines. Claws simple. Worker unknown. (Ethiopian)........ **Leptopone** Arnold.

Worker and female: median area of the clypeus deeply excavated in the middle, shining, with heavy striæ, bordered laterally by strong ridges. Antennæ filiform. Middle tibiæ without rows of heavy spines. Postpetiole with a ventral, blunt, compressed tooth near its junction with the petiole. Claws with a small tooth near the middle. (Ethiopian).... **Paltothyreus** Mayr.

9. Anterior margin of the clypeus with a tooth on each side of a median emargination. Claws with a median tooth. Female unknown. (Neotropical)........................ **Dinoponera** Roger.

Anterior margin of the clypeus not or bluntly bidentate; in the latter case the claws simple............................10.

10. Mesepisternum with an oval cavity leading to the first stigma which is covered by a small pronotal lobe. Petiole with a pair of spines directed backwards. Claws simple. Female unknown, probably ergatoid. (Indomalayan, Papuan, Australian). **Diacamma** Mayr.

Mesepisternum of the usual shape.........................11.

11. Claws with a tooth near their base. Cheeks carinate. Scape of the antennæ compressed. Scale of the petiole thick, more or less nodiform. Female wingless, ergatoid. (Ethiopian). **Megaponera** Mayr.

Claws simple[1]...12.

12. Eyes large, placed behind the middle of the head length. Female unknown. (Ethiopian).............. **Ophthalmopone** Forel.

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[1] *Euponera peringueyi* Emery and *E. havilandi* (Forel) are described as having a small tooth near the base or the middle of the claws. Yet they can not well be placed in *Megaponera*. It is possible that, when better known, they will be separated as a genus, for which the name *Hagensia* Forel (type: *Megaloponera* (*Hagensia*) *havilandi* Forel) could then be used.

Eyes placed in the middle or before the middle of the sides of the head..13.

13. Cheeks carinate. Eyes placed about or slightly before the middle of the sides of the head. Female winged. (Neotropical).
Neoponera Emery.

a. Mandibles almost sublinear. Node of the petiole club-shaped, being gradually raised behind.............Subgenus **Eumecopone** Forel.
Mandibles subtriangular. Node of the petiole not club-shaped.
Subgenus **Neoponera**, *sensu stricto*.

Cheeks not carinate. Eyes placed before the middle of the sides of the head..14.

14. Mesoëpinotal suture obsolete in the worker. Usually large-sized species. Female winged..............................15.

Mesoëpinotal suture more or less distinct...................18.

15. Pronotum more or less marginate on the sides. (Neotropical to Texas)..........................**Pachycondyla** F. Smith.

Pronotum not marginate on the sides.......................16.

16. Upper part of the head separated from the sides and from the occiput by a blunt ridge. Mesepisternum of the worker divided from the sternum by a distinct suture. (Ethiopian, Indomalayan, Japan, Papuan, Australian)..**Ectomomyrmex** Mayr.

Upper part of the head not separated from the sides and from the occiput by a ridge. Mesepisternum fused with the sternum in the worker (except in one Malagasy species).............17.

17. Petiole surmounted by a flattened scale which curves back over the postpetiole and terminates in a comb of five teeth. Gaster without constriction behind the postpetiole. Epinotum with two stout spines. Mandibles elongate. (West Africa).
Phrynoponera Wheeler.

Petiole with a thick node, rarely somewhat compressed and dentate above or behind. Gaster with pronounced constriction between the postpetiole and succeeding segment. Epinotum usually unarmed. Mandibles subtriangular. (Ethiopian, Malagasy, Indomalayan, Papuan, Australian).
Bothroponera Mayr.

18. Mandibles subtriangular, with a distinct edge between the apical or masticating and the basal, inner margin. Female winged. (Tropicopolitan, Mediterranean, Japan, New Zealand).
Euponera Forel.

a. Mandibles elongate, with an extensive masticating margin, which is armed with numerous teeth. First joint of the funiculus as a rule shorter than, or as long as, the following, seldom longer (including *Xiphopelta* Forel) .... Subgenus **Mesoponera** Emery.

Mandibles comparatively short, with small or a few teeth. First joint of the funiculus noticeably longer than the following .... *b.*

b. Length 9 to 10 mm. Mandibles with 8 teeth. (Malagasy). Subgenus **Euponera,** *sensu stricto.*

Much smaller .... *c.*

c. Mesonotum convexly swollen, surrounded by a deeply impressed suture. Metatarsus of the middle legs without stiff hairs on its dorsal face. Subgenus **Brachyponera** Emery.

Mesonotum depressed; surrounding suture not deeply impressed. Middle legs short, their metatarsi furnished with stiff hairs or spines on their dorsal face .... Subgenus **Trachymesopus** Emery.

Mandibles long and narrow; their masticating, apical margin passes through a curve into their basal, inner margin. Middle legs short, their metatarsi with stiff hairs above. **Pseudoponera** Emery.

a. Apex and masticating margin of the mandibles strongly dentate. Eyes very small. Female winged. (Indomalayan). Subgenus **Pseudoponera,** *sensu stricto.*

Apex of the mandibles dentate, their masticating margin with feeble traces of teeth. Eyes obsolete or absent. Female unknown. (Ethiopian). Subgenus **Promyopias** Santschi.

19. Mandibles subtriangular, very long, ending in a very elongate apical tooth, the apical margin also with three long teeth. Clypeus unarmed, without projecting lobe. Eyes absent. Mesoëpinotal suture obsolete. Integument moderately punctate. Abdomen with feeble pubescence. Female unknown. (Indomalayan) .... **Emeryopone** Forel.

Not having all these characters .... 20.

20. Integument very finely and densely punctate. At least the abdomen with abundant pubescence. No lateral spur on hind and middle tibiæ .... 21.

Integument smooth, or sparsely punctate, or coarsely sculptured. Abdomen without pubescence .... 23.

21. Clypeus with a sharp point in the middle of its anterior margin. Mandibles elongate, narrow, with 3 to 5 strong teeth. Eyes vestigial. Female unknown. (Neotropical). **Belonopelta** Mayr.

Clypeus unarmed .... 22.

22. Antennæ ending in a 4-jointed club. Eyes vestigial or absent. Female winged, with eyes. (Ethiopian, Indomalayan, Papuan) . . . . **Cryptopone** Emery.
Antennæ without distinct club or the club is 5-jointed. Eyes small, sometimes obsolete or absent. Female winged; sometimes also an ergatoid female present. (Cosmopolitan).
Ponera Latreille.

23. The two lobes of the frontal carinæ fused into a plate which is slightly notched in front above the clypeus. Clypeus much produced into a broad plate, truncate in front and with sharp lateral angles. Mandibles subtriangular, their apical margin strongly dentate. Eyes small. Female unknown. (Ethiopian) . . . . **Asphinctopone** Santschi.
Clypeus not projecting, or with a narrow median lobe (*Trapeziopelta*), but in that case the mandibles are linear . . . . 24.

24. Clypeus short; the frontal carinæ contiguous and forming a plate which is raised above the clypeus. Mandibles slightly curved, linear, broadened and spear-shaped in their apical third, ending in a blunt apex; hollowed out into a rim along their inner margin. Eyes vestigial. Female unknown. (Ethiopian).
Cacopone Santschi.
Clypeus, frontal carinæ, and mandibles shaped differently . . . . . . 25.

25. Clypeus with a projecting median lobe. Eyes present or vestigial. Mandibles linear. Lateral spur of the middle and hind tibiæ small, but present. Claws simple. Female winged. (Malayan, Papuan) . . . . **Trapeziopelta** Mayr.
Clypeus without projecting median lobe . . . . 26.

26. Mandibles falciform, flattened, broadened towards the third of their length, ending in a sharp point. Eyes present. Female winged. (Ethiopian) . . . . **Psalidomyrmex** Ern. André.
Mandibles not falciform, nor flattened . . . . 27.

27. Mandibles linear, arcuate, pointed, with one tooth or two spaced teeth along their basal, inner margin. Eyes vestigial. Female winged, with eyes. (Indomalayan, Papuan, Ethiopian).
Myopias Roger.
Mandibles blunt at the apex, linear, with a few irregular teeth along their inner margin. Eyes small. Female winged (or in some species ergatoid?). (Ethiopian) . . **Plectroctena** F. Smith.

♂

The male of the following genera is unknown: *Glyphopone* Forel, *Leptopone* Santschi, *Ectomomyrmex* Mayr, *Phrynoponera* Wheeler, *Pseudoponera* Mayr, *Emeryopone* Forel, *Belonopelta* Mayr, *Cryptopone* Emery, *Trapeziopelta* Mayr, *Myopias* Roger, *Asphinctopone* Santschi, and *Cacopone* Santschi.

1. Middle and hind tibiæ with two spurs, those on the middle tibiæ sometimes very small..................................2.

Middle and hind tibiæ with a single spur....................12.

2. The two spurs of the middle tibiæ very small, simple. Median spur of the hind tibiæ large, pectinate. Mandibles very short, without teeth. Antennæ short. Pygidium without spine. Mesonotum with Mayrian furrows....**Centromyrmex** Mayr.

Median spur of both middle and hind tibiæ large and pectinate...3.

3. Postpetiole pyriform, almost forming a second node of the pedicel. Mandibles rather vestigial. Antennæ long. Pygidium with a long terminal spine. Mesonotum with two deep, converging furrows......................**Harpegnathos** Jerdon.

Postpetiole as usual, with a feeble or indistinct constriction between it and the gaster..................................4.

4. Scape club-shaped and flattened, distinctly longer than the third antennal joint. Frontal carinæ vestigial. Mandibles very short, blunt. Pygidium not ending in a spine.

Megaponera Mayr.

Scape shorter than the third antennal joint; if almost equal, the mandibles end in a long, sharp point and the frontal carinæ are distinct...5.

5. Scape only slightly shorter than the third antennal joint. Mandibles ending in a long, sharp point. Frontal carinæ distinct.

Ophthalmopone Forel.

Scape much shorter than the third antennal joint..............6.

6. Pygidium continued into a curved spine.........................7.

Pygidium blunt or pointed, but not continued into a spine......9.

7. Anterior margin of the clypeus produced into a rectangular lobe. Frontal carinæ absent. Pronotum without Mayrian furrows. Claws toothed.........................**Dinoponera** Roger.

Anterior margin of the clypeus without projecting, rectangular lobe...8.

8. Anterior margin of the clypeus strongly, arcuately projecting in the middle..............................**Diacamma** Mayr.

Anterior margin of the clypeus truncate or feebly projecting.
Neoponera Emery.
Pachycondyla F. Smith.
Bothroponera Mayr.
Euponera Forel.

9. Petiole unarmed ventrally..............................10.
Petiole with a strongly projecting, ventral lamella ending behind in a tooth or spine. Postpetiole unarmed ventrally......11.

10. At least 15 mm. long. Postpetiole ventrally with a strong tooth which is curved behind. Pygidium pointed.
Paltothyreus Mayr.
Much smaller. Postpetiole unarmed ventrally..**Euponera** Forel.

11. Black. Ventral lamella of the petiole ending behind in a tooth-shaped, projecting angle. Pygidium blunt.
Odontoponera Mayr.
Testaceous. Ventral lamella of the petiole ending behind in a spine. Pygidium pointed, carinate..........**Streblognathus** Mayr.

12. Pygidium pointed or ending in a spine. Scutellum depressed or feebly convex. Integument finely punctate. In some species also ergatoid, wingless males..........**Ponera** Latreille.
Pygidium blunt. Scutellum projecting above. Integument with coarse sculpture. Large species........................13.

13. Mesonotum with converging furrows......**Plectroctena** F. Smith.
No converging furrows on the mesonotum.
Psalidomyrmex Ern. André.

11. **Onychomyrmicini** Ashmead

Onychomyrmex Emery. (Australian). ♂ unknown.

12. **Leptogenyini** Forel

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1. Mandibles very narrow, sublinear, with teeth all along the inner basal margin. Female unknown. (Australian).
Prionogenys Emery.
Mandibles linear without teeth along the inner margin, or more or less triangular, with or without teeth. Female as far as known, ergatoid. (Neotropical, southern Nearctic, Ethiopian, Malagasy, Indomalayan, Papuan, Australian)..**Leptogenys** Roger.

a. Mandibles very long, but crossing each other feebly, enclosing a large space between them and the clypeus, linear, acute or with two small apical teeth placed close together. (Distribution as for the genus).
Subgenus **Leptogenys**, *sensu stricto*.

Mandibles differently shaped . . . . *b.*

b Mandibles broadly crossing each other; very elongate but not linear, somewhat broadened to the half or two-thirds of their length, then narrowed into a sharp point; sometimes with a preapical tooth. (Malagasy) . . . . Subgenus **Machærogenys** Emery.

Mandibles less lengthened . . . . *c.*

c Clypeus armed with several teeth. Petiole lengthened into a spine (Australian) . . . . Subgenus **Odontopelta** Emery.

Clypeus unarmed or with a tooth on each side. Petiole not lengthened into a spine (distribution as for the genus) . Subgenus **Lobopelta** Mayr.

The male is known only for *Leptogenys*; it differs from all other known male Ponerinæ in having pectinate claws.

13. **Odontomachini** Mayr

☿, ♀, ♂

1. Worker: no oblique swellings starting from the eyes to border the antennal fossæ; the latter not confluent; the head without distinct postocular hollows. Female similar, winged or ergatoid. Male: pygidium usually not terminating in a spine. (Tropicopolitan, Mediterranean) . . . . **Anochetus** Mayr.

a. Worker and female: head more or less broad, as a rule broadly emarginate behind; mandibles usually short, broadened in their distal part and narrowed just before the preapical tooth. (Tropicopolitan). Subgenus **Anochetus**, *sensu stricto*.

Worker: head elongate, narrowed behind, not or feebly emarginate at the hind margin; mandibles long, not broadened in their distal part, denticulate along the entire inner margin. Female unknown. (Neotropical) . . . . Subgenus **Stenomyrmex** Mayr.

On each side of the face an oblique swelling extending out from the eye and bordering the antennal fossæ . . . . 2.

2. Worker: antennal fossæ confluent in a frontal depression, behind the frontal carinæ, and separated by two rounded ridges from the deep and oblique postocular hollows. Female similar, winged. Male with the pygidium ending in a spine. (Tropicopolitan, southern Nearctic) . . . . . . **Odontomachus** Latreille.

Worker: antennal fossæ not confluent on the front; postocular hollows feebly marked. Female ergatoid. Male unknown. (Malagasy) . . . . **Champsomyrmex** Emery.

PSEUDOMYRMINÆ Emery

This subfamily contains only one tribe, the Pseudomyrmini of Forel.

☿, ♀

1. Clypeus neither inflected nor dentate, not or feebly emarginate. (Neotropical, southern Nearctic)...... **Pseudomyrma** Guérin.

Clypeus suddenly descending in front, or as if inflected or subtruncated, usually armed with teeth at the level of this inflection; rarely it is uniformly sloping and deeply emarginate at the anterior border. (Paleotropical)....................2.

2. Large and stout species. Frontal carinæ farther apart. Maxillary palpi 5-jointed, labial palpi 4-jointed. Petiole and postpetiole armed beneath with a stout tooth. Worker with three well-developed ocelli. Male: antennæ as in *Tetraponera*; the pro- and mesosterna not separated by a gap. Fore wings with two cubital cells. Youngest larval stage (trophidium) with exudate organs in the form of elongate appendages. (Ethiopian).

Pachysima Emery.

Smaller and more slender species. Frontal carinæ closer together. Petiole and postpetiole without stout teeth ventrally. Worker with one, two, or three ocelli. Youngest larval stage with the exudate organs in the form of simple tubercles.............3.

3. Maxillary and labial palpi 3-jointed. Worker: eyes small (about ⅙ of the sides of the head); first joint of the funiculus very long, joints 2–7 very short and transverse, the three terminal joints forming a distinct clava. Female: winged or ergatoid, otherwise much like the worker but with developed ocelli. Male: second funicular joint much shorter than the scape, not longer than the first; a deep ventral gap between pro- and mesosterna; fore wing with one cubital cell. (West African).

Viticicola Wheeler.

Maxillary palpi 5-jointed, labial palpi 4-jointed. Worker: eyes much larger (about ⅓ or more of the sides of the head); funiculus gradually tapering to the slightly thickened tip, without clava. Female: winged, no ergatoid form known. Male: second funicular joint much longer than the first, only slightly shorter than the scape. Fore wing of female and male with two cubital cells. (Ethiopian, Malagasy, Palestine, Indomalayan, Papuan, Australian)................**Tetraponera** F. Smith.

Myrmicinæ Lepeletier

Key to the Tribes

☿, ♀

1. Clypeus not prolonged back between the frontal carinæ, its posterior margin rounded. Median spurs of middle and hind tibiæ pectinate. Ocelli almost always developed in the worker. Antennæ thickened, 11-jointed in worker and female, 12-jointed in the male; the funiculus much flattened in female and worker. Legs of worker and female short; the femora broad, distinctly compressed; the middle and hind tibiæ and metatarsi ending in a circlet of teeth. Fore wings with one closed cubital cell. . . . . METAPONINI Forel.

Clypeus almost always prolonged between the frontal carinæ; if not, the spurs of middle and hind tibiæ are simple or absent. In the ordinary worker the ocelli are not developed; but in strongly dimorphic species they may be more or less distinct in the worker major or soldier . . . . 2.

2. Median spurs of middle and hind tibiæ pectinate. Antennæ 12-jointed. Fore wings as a rule with two closed cubital cells, or the separation between the two is incomplete; if with one closed cubital cell, the cubitus is united with the radius by a moderately long intercubitus . . . . MYRMICINI F. Smith.

Spurs of the middle and hind tibiæ simple or absent, sometimes barbulate, very rarely finely pectinate . . . . 3.

3. Head more or less cordate, emarginate on the occipital margin and strongly narrowed in front; its posterior angles broadly rounded and devoid of spines (except in *Microdaceton*) . . . . . . 4.

Head differently shaped; either not cordate or with its posterior angles spinose . . . . 5.

4. Antennæ of female and worker 4- to 12-jointed, the last joint very much longer than the preceding; 13-jointed in the male. Mandibles not falcate, usually porrect. Fore wings originally with one closed cubital and a closed radial cell, but the venation often much reduced . . . . DACETONINI Forel.

Female: antennæ 12-jointed; mandibles falcate; frontal carinæ forming a bifurcate plate which overlaps the clypeus; antennal scrobes deep, containing the antennal scape. Male: antennæ 13-jointed. Fore wings with two closed cubital and a closed radial cell. Worker unknown . . . STEGOMYRMICINI, new tribe.

5. Frontal carinæ closely approximated. Thorax unarmed, without dorsal sutures or impressions in the worker. Fore wings with one closed cubital and a closed radial cell.
Melissotarsini Emery.

Frontal carinæ more or less distant; if close to each other (as in certain Attini) the thorax has a distinct mesoëpinotal depression...6.

6. Postpetiole articulated to the dorsal surface of the following segment. Thorax with more or less distinct dorsal sutures in the worker, impressed at the mesoëpinotal suture. Antennæ 10- or 11-jointed. Front wings with one closed cubital cell; the radial cell variable; the intercubitus sometimes very short or disappearing..................**Crematogastrini** Forel.

Postpetiole inserted at the anterior end of the following segment .7.

7. Worker: thorax flat, subtriangular, without dorsal sutures or impressions; epinotum with two pairs of spines and a broad, flat declivity. Petiole and postpetiole short and thick, not pedunculate; the gaster also short and broad. Antennæ 12-jointed, with a feeble, short, 3-jointed club. Cheeks strongly margined behind. Clypeus with 3-lobed anterior border. ♀ and ♂ unknown.................**Archæomyrmicini** Mann.

Worker: without all these characters combined; either the antennæ 11-jointed, or the thorax with dorsal sutures, or the epinotum unarmed or bispinose..........................8.

8. Worker: thorax without dorsal sutures or impressions; the epinotum bispinose. Antennæ 11-jointed in all sexes; the 3 terminal joints forming a club in the worker. Wings with one closed cubital and a closed radial cell.
Stereomyrmicini Emery.

Worker: thorax with more or less distinct dorsal sutures; usually impressed at the mesoëpinotal suture; when the thorax has no impressions or sutures, the epinotum is usually unarmed or the other characters do not all agree..........................9.

9. Worker and female: antennæ 7-jointed, elongate, without distinct club; scape not enclosed in a groove; epinotum bispinose. Male: antennæ 13-jointed; abdomen cordate and flattened. Fore wings with one closed cubital and an open radial cell.
Myrmicariini Forel.

Worker and female almost always with more than 7 joints in the antennæ; when 7-jointed, the last joint is very large, or there is a differentiated club, or the scape may be enclosed in a deep groove, or the epinotum is unarmed. Abdomen of the male not cordate nor flattened..............................10.

10. Antennal scrobe deep, capable of containing the folded antenna, placed at the side of the head, below the eyes; the carina formed by its dorsal margin (and which does not correspond to the frontal carina of other ants) passes outside of the eye; posterior angles of the head usually pointed or prolonged or denticulate. Antennæ 11-jointed in all sexes. Epinotum often spinose or tuberculate. Body broad, flattened. Fore wings with one closed cubital, an open radial and no discoidal cell. (Old World tropics)....CATAULACINI Emery.

No antennal scrobe, or if a groove is present it is shaped differently and is delimited on the inner side only by the frontal carinæ. Antennæ of the male usually 12- or 13-jointed.........11.

11. Frontal carinæ continuing backward above the eyes on the sides of the head; a scrobe in front of the eye sufficiently deep to conceal the whole antennal scape. Epinotum well developed and with a long basal face. Body broad, flattened, often with scale-like hairs. Antennæ 11-jointed in female and worker, the funiculus swollen, but without differentiated club; 13-jointed in the male. Gizzard fungiform, of peculiar structure. Fore wings with one closed cubital and a closed radial cell. (Neotropical).........................CRYPTOCERINI F. Smith.

Scrobe absent or feebly marked or placed differently. When the scrobe is similar (as in certain Meranoplini) the epinotum is short, with the basal face feebly developed or absent. Gizzard of the usual form..................................12.

12. Worker and female: the shallow antennal scrobes bordered laterally by a more or less distinct carina of the cheeks; antennæ 11-jointed (with the exception of *Proatta*, where they are 12-jointed). Fore wings with one closed cubital cell. (Neotropical with the exception of *Proatta*)..............13.

Antennal foveæ or scrobes not bordered below by a carina of the cheeks...15.

13. Worker and female: antennæ with a distinct club of three joints, the last of which is decidedly predominant. Male: antennæ 13-jointed. Fore wings with the brachius developed beyond the nervulus, the brachial cell being more or less complete; intercubitus very short or absent. Workers monomorphic. OCHETOMYRMICINI Emery.

Worker and female: antennæ usually without distinct club and the terminal joint not predominant. Fore wings with the brachius not developed beyond the nervulus, the latter passing by a loop into the submedius; very rarely (*Sericomyrmex*, *Myrmicocrypta*) there is a trace of brachius beyond that loop; radial cell closed; no discoidal cell. Workers sometimes dimorphic. 14.

14. Worker: antennæ 12-jointed; fore tarsi not dilated. Male: antennæ 13-jointed; pterostigma well developed. Female unknown. Not fungus-growing. (Sumatra). . PROATTINI Forel.

Worker and female: antennæ 11-jointed. Fore tarsi of the worker more or less dilated. Male: antennæ usually 13-jointed (12-jointed in *Sericomyrmex* and certain *Cyphomyrmex*; 11-jointed in *Pseudoatta*). Pterostigma narrow or absent. Fungus-growing ants. (Neotropical and southern Neárctic). ATTINI F. Smith.

15. Worker: monomorphic; head underneath with a psammophore; the body long and slender; petiole pedunculate, the peduncle very thin and longer than the node; postpetiole more or less barrel-shaped; gaster small, more or less pyriform; legs very long and slender; antennæ 12-jointed, nearly filiform. Female probably highly ergatoid, wingless. Male: antennæ 13-jointed, the scape very short; fore wings with one closed cubital, a short closed radial, and no discoidal cell. OCYMYRMICINI Emery.

Worker: only exceptionally with a psammophore, in which case the other characters given above do not agree; the antennæ often terminate in a club. . . . . 16.

16. Worker: monomorphic; thorax as a rule short; promesonotum large; epinotum with a very short or no basal face; often the mesonotum overarches the epinotum; hairs usually dense and soft, or spatulate; antennæ 9- to 12-jointed (also in the female), usually partly concealed in a scrobe which is sometimes similar to that of the Cryptocerini. Male: antennæ 12- or 13-jointed; Mayrian furrows very distinct. Fore wings with one closed cubital and a closed radial cell. . . . . . MERANOPLINI Emery.

Worker: thorax of the usual shape; the epinotum usually with a distinct basal face. . . . . 17.

17. Worker and female: antennæ 12-jointed, the three last joints forming an incrassate club; epinotum with two spines or teeth; in the worker the promesonotal suture obsolete dorsally, the mesoëpinotal distinctly impressed; legs slender; middle and hind tibiæ without spurs; petiole with long, cylindrical peduncle and a broad oval node; postpetiole usually large; body hairs simple. Worker minute, monomorphic. Male often wingless and ergatoid. Fore wing with one cubital and a very incomplete radial cell; the brachius is not developed beyond the nervulus..............Cardiocondylini Emery.

Not presenting all these characters; either the spurs are present, or the body hairs are clavate, or the number of antennal joints is different, etc......................................18.

18. [1]Fore wings with two closed cubital cells (except in *Stenamma*, *Oxyopomyrmex* and certain *Aphænogaster*). Antennæ usually 12-jointed in worker and female, and 13-jointed in the male (except in *Oxyopomyrmex*, *Machomyrma*, and a few *Pheidole*). Pheidolini Emery.

Fore wings with one closed cubital cell.......................19.

19. Fore wings with the radial cell variously shaped; the venation usually of the *Solenopsis* type, with a more or less developed intercubitus; in a few cases the intercubitus is very short or lacking (type of *Formica*).........................20.

Venation of the fore wings of the *Formica* type, the intercubitus being very short or altogether absent....................21.

20. Radial cell either open or closed. Antennæ of worker and female 7- to 12-jointed, often with a 2- or 3-jointed club; in the male 12- or 13-, rarely 11-jointed. Mayrian furrows of the male absent or indistinct (except in *Huberia* and the subgenus *Chelaner* of *Monomorium*).

Solenopsidini Forel (including Pheidologetonini Emery).

Characters negative; genera which cannot be placed in any other tribe. Radial cell as a rule closed. Mayrian furrows usually very distinct in the male..........Myrmecinini Ashmead.

21. Antennæ 11- or 12-jointed in worker and female, with a 2- or 3-jointed club; more than 10-jointed in the male. Epinotum usually spinose....................Leptothoracini Emery.

Antennæ 10- to 12-jointed in worker and female; 10-jointed in the male, four joints being fused into a long one. Clypeus with a posterior ridge bordering the antennal foveæ.

Tetramoriini Emery.

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[1] The following five tribes are very unsatisfactorily defined, chiefly on the winged, sexual forms. Since the worker phase is more frequently met with, I have prepared a key based on these forms and including all the genera of the tribes in question. See pp. 670-687

1. **Myrmicini** F. Smith

☿

1. Thoracic dorsum without any trace of suture or impression ..... 2.
Thoracic dorsum impressed at the mesoëpinotal suture; promesonotal suture usually distinct .... 3.

2. Mandibles not of the granivorous type, elongate and narrow; their inner margin very oblique, with 5 or 6 indistinct teeth and passing without angle into the apical margin. Labrum bidentate, projecting beyond the anterior margin of the clypeus. Petiole cylindrical, without distinct node. (Neotropical) .... **Hylomyrma** Forel.
Mandibles subtriangular and broad, with a distinct angle between the apical and inner margins. Labrum not projecting nor bidentate. Petiole with a very distinct node. (Neotropical and Nearctic) .... **Pogonomyrmex** Mayr.

a. Small species, roughly sculptured. Head short. Mandibles much curved. Under side of the head without psammophore.
Subgenus **Ephebomyrmex** Wheeler.

Larger species, usually with less coarse sculpture. Head with a psammophore underneath. Usually with only two epinotal spines, which are sometimes absent. A few species are polymorphic.
Subgenus **Pogonomyrmex**, *sensu stricto*.

Larger species, very opaque, with fine sculpture. Epinotum with two pairs of spines. Mandibles less convex than in *Pogonomyrmex*, *sensu stricto*; probably not granivorous; no psammophore on the under side of the head which is lengthened.
Subgenus **Forelomyrmex** Wheeler (=*Janetia* Forel).

3. Funiculus of the antennæ filiform, the terminal joints not forming a club. Under side of the head with a psammophore. Head almost square. (Ethiopian) .... **Cratomyrmex** Emery.[1]
Funiculus of the antennæ slightly swollen into a 3- to 5-jointed club. Under side of the head without psammophore. Head longer than broad. (Holarctic, Indomalayan) .... **Myrmica** Latreille.

a. Epinotum bispinose. Club of the antennæ 3- or 4-jointed.
Subgenus **Myrmica**, *sensu stricto*

Spines of the epinotum replaced by blunt projections. Club of the antennæ 5-jointed.
Subgenus **Manica** Jurine (=*Neomyrma* Forel; *Oreomyrma* Wheeler).

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[1] In a recent paper [1920, Ann. Soc. Ent. France, LXXXVIII (1919), p. 378] Santschi writes "Since I know the entire series of workers of *C. regalis*, I am no longer able to differentiate them from the genus *Messor*, the female alone is somewhat aberrant in its large size. *Cratomyrmex* is at most a subgenus of *Messor*." Emery in his original description of the genus states that in *Cratomyrmex* the tibial spurs are feebly pectinate. In *Messor* they are simple. In the absence of specimens of *Cratomyrmex* I have preferred to leave this genus provisionally among the Myrmicini.

2. **Pheidolini** Emery

This tribe contains the following genera: *Stenamma* Westwood; *Sifolinia* Emery; *Aphænogaster* Mayr; *Messor* Forel; *Novomessor* Emery; *Veromessor* Forel; *Goniomma* Emery; *Oxyopomyrmex* Ern. André; *Machomyrma* Forel; *Ischnomyrmex* Mayr; *Ceratopheidole* Pergande; *Parapheidole* Emery; *Decapheidole* Forel; *Pheidole* Westwood; *Epipheidole* Wheeler; *Sympheidole* Wheeler. (See p. 670).

3. **Melissotarsini** Emery

☿

1. Female and worker: antennæ 6-jointed, ending in a two-jointed club; legs short and thick; the hind metatarsi dilated and slightly compressed. Male: antennæ 12-jointed, filiform; tarsi simple. (Ethiopian, Malagasy). . **Melissotarsus** Emery.

Worker: antennæ 10-jointed; metatarsi not dilated. Female: antennæ 11-jointed, very short, the 9 apical joints forming a thick club; metatarsi not dilated. Male: antennæ 12-jointed. (Ceylon, Singapore) . . . . **Rhopalomastix** Forel.

4. **Metaponini** Forel

Metapone Forel. (Indomalayan, Australian).

5. **Stereomyrmicini** Emery

Stereomyrmex Emery. (Ceylon).

6. **Myrmicariini** Forel

Myrmicaria W. Saunders. (Ethiopian, Indomalayan, Papuan).

7. **Cardiocondylini** Emery

Cardiocondyla Emery. (Tropicopolitan and warm temperate regions).

This tribe also includes *Xenometra* Emery, of which only the female is known.

8. **Crematogastrini** Emery

Crematogaster Lund. (Tropicopolitan and warm temperate regions; in North America reaching to Canada).[1]

a. **Antennæ 10-jointed.**

Subgenus **Decacrema** Forel (Type *C.* (*Decacrema*) *decamera* Forel)

Antennæ 11-jointed. . . . . *b.*

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[1] The following key to the subgenera is largely a translation of Santschi's recent key published in the Bull. Soc. Ent. France, 1918, pp. 183–184.

b. Epinotal spines enormously developed. Petiole elongate and pedunculate. Antennal club 2-jointed.
Subgenus **Rhachiocrema** Mann. (Type: *C. (Rhachiocrema) wheeleri* Mann).
Epinotal spines of normal size .... *c.*
c. Frontal carinæ short. Terminal border of mandibles of the female very oblique .... *d.*
Frontal carinæ well developed. Mandibles of female of the usual shape . . *e.*
d. Antennal club 3-jointed. Postpetiole of female much broader than long.
Subgenus **Oxygyne** Forel. (Type: *C. (Oxygyne) daisyi* Forel).
Antennal club of more than 3 joints in the worker, filiform in the female; postpetiole narrow.
Subgenus **Nematocrema** Santschi. (Type: *C. stadelmanni* Mayr).
e. Pronotum armed with spines.
Subgenus **Xiphocrema** Forel. (Type: *C. tetracantha* Emery).
Pronotum unarmed .... *f.*
f. Epinotum dilated.
Subgenus **Physocrema** Forel. (Type: *C. inflata* F. Smith).
Epinotum not dilated, of the usual form .... *g.*
g. Petiole with parallel sides, usually straight or scarcely arcuate, rarely broader posteriorly than anteriorly .... *h.*
Petiole broadened in front, trapezoidal, sometimes truncated or rounded at the anterior angles, sometimes oval .... *j.*
h. Antennal club 2-jointed .... *i.*
Antennal club 3-jointed; postpetiole more or less impressed.
Subgenus **Eucrema** Santschi. (Type: *Formica acuta* Fabricius).
i. Postpetiole entire.
Subgenus **Orthocrema** Santschi. (Type: *Myrmica sordidula* Nylander).
Postpetiole incised or impressed. Petiole often with slightly blunt or rounded posterior angles.
Subgenus **Neocrema** Santschi. (Type: *C. distans* Mayr).
j. Postpetiole entire, without a median furrow.
Subgenus **Sphærocrema** Santschi. (Type: *C. kneri* Mayr).
Postpetiole grooved or impressed .... *k.*
k. Antennal club 4-jointed or indistinct.
Subgenus **Paracrema** Santschi. (Type: *C. spengeli* Forel).
Antennal club 3-jointed .... *l.*
l. Postpetiole merely impressed behind. Promesonotal suture impressed; mesonotum carinate in front. Epinotal spines often curved downward. Basic sculpture densely striate.
Subgenus **Atopogyne** Forel. (Type: *Formica depressa* Latreille).
Postpetiole grooved, or if merely impressed the body is shaped differently.
Subgenus **Crematogaster**, *sensu stricto*. (Type: *Formica scutellaris* Olivier).

9. **Solenopsidini** Forel

(Including the Pheidologetini Emery)

This tribe contains the following genera: *Vollenhovia* Mayr; *Heteromyrmex* Wheeler; *Huberia* Forel; *Monomorium* Mayr; *Epixenus* Emery; *Trichomyrmex* Mayr, *Hagioxenus* Forel; *Wheeleriella* Forel; *Phacota*

Roger; *Paraphacota* Santschi; *Xenomyrmex* Forel; *Allomerus* Mayr; *Megalomyrmex* Forel; *Liomyrmex* Mayr; *Epœcus* Emery; *Anergates* Forel; *Anergatides* Wasmann; *Tranopelta* Mayr; *Carebarella* Emery; *Diplomorium* Mayr; *Bondroitia* Forel; *Solenopsis* Westwood; *Lophomyrmex* Emery; *Trigonogaster* Forel; *Pheidologeton* Mayr; *Aneleus* Emery; *Aëromyrma* Forel; *Oligomyrmex* Mayr; *Erebomyrma* Wheeler; *Carebara* Westwood; *Pædalgus* Forel. (See p. 670).

10. **Myrmecinini** Ashmead

This tribe contains the following genera: *Podomyrma* Smith; *Lordomyrma* Emery; *Atopomyrmex* Ern. André; *Dilobocondyla* Santschi; *Terataner* Emery; *Atopula* Emery; *Brunella* Forel; *Paratopula* Wheeler; *Myrmecina* Curtis; *Pristomyrmex* Mayr; *Acanthomyrmex* Emery; *Dacryon* Forel. (See p. 670).

11. **Archæomyrmicini** Mann

Archæomyrmex Mann. (Fiji Islands).

12. **Meranoplini** Emery

☿

1. Eyes prolonged downward into a point. Antennal scrobes deep, capable of containing the scape. Antennæ 12-jointed, with a rather distinct, 2-jointed club. Mesonotum not overlapping the epinotum, the latter oblique. Body with feeble, simple pilosity. Minute. Female and male unknown. (Australian). **Mayriella** Forel.

   Eyes of the normal shape, rounded or oval....................2.

2. Pro- and mesonotum more or less fused into a single disc, the posterior margin of which is more or less toothed and overlaps the epinotum; the latter vertical, or very steep, without basal face. Pilosity rather long, abundant, simple, often woolly. 3.

   Pro- and mesonotum not or more or less fused, but unarmed behind and not overlapping the epinotum; the latter oblique, with a short basal face. Antennal scrobes more or less pronounced. 4.

3. Antennæ 12-jointed, with 3-jointed club. Frontal carinæ short and narrow, not forming scrobes. Epinotum bispinose. Scale of the petiole bispinose. Male and female unknown. (New Caledonia)........................**Promeranoplus** Emery.

   Antennæ 9-jointed, with 3-jointed club. Antennal scrobes deep, placed along the sides of the head above the eyes and capable of containing the scape or the whole of the folded antennæ.

Antennæ 9-jointed in the female, 13-jointed in the male. (Ethiopian, Malagasy, Indomalayan, southern China, Papuan, Australian)........................**Meranoplus** F. Smith.

4. Antennæ 12-jointed with a 3-jointed club. Antennal carinæ moderately broadened and prolonged behind, limiting vestigial scrobes. Clypeus with a median, bilobed, projecting plate. Epinotum bispinose. Pilosity simple and sparse. Male and female unknown. (New Caledonia).....**Prodicroaspis** Emery.

Antennæ 11- or 12-jointed. Clypeus without bilobed median process. Antennal scrobes deep, placed along the sides of the head, above the eyes. Pilosity as a rule partly composed of spatulate hairs. (Ethiopian, Indomalayan, Papuan, Australian)......................**Calyptomyrmex** Emery.

a. Antennæ 12-jointed, with 3-jointed club.
Subgenus **Calyptomyrmex**, *sensu stricto*

Antennæ 11-jointed, with 3-jointed club....Subgenus **Dicroaspis** Emery.

13. **Leptothoracini** Emery

This tribe includes the following genera: *Macromischa* Roger; *Macromischoides* Wheeler; *Leptothorax* Mayr; *Harpagoxenus* Forel; *Myrmoxenus* Ruzsky; *Formicoxenus* Mayr; *Epimyrma* Emery; *Symmyrmica* Wheeler; *Rogeria* Emery; *Lachnomyrmex* Wheeler; *Apsychomyrmex* Wheeler; *Adelomyrmex* Emery. (See the key, p. 670).

14. **Ocymyrmicini** Emery

Ocymyrmex Emery. (Ethiopian).

15. **Tetramoriini** Emery

This tribe includes the following genera: *Tetramyrma* Forel; *Lundella* Emery; *Tetramorium* Mayr; *Rhoptromyrmex* Mayr; *Acidomyrmex* Emery; *Strongylognathus* Mayr; *Xiphomyrmex* Forel; *Decamorium* Forel; *Triglyphothrix* Forel; *Eutetramorium* Emery. (See p. 670).

16. **Ochetomyrmicini** Emery

☿

1. Clypeus transversely arched, almost straight in a longitudinal direction; triangularly projecting and flattened in front. (Neotropical)......................**Ochetomyrmex** Mayr.

Clypeus arched both longitudinally and transversely. (Neotropical; one species introduced into West Africa)..**Wasmannia** Forel.

17. **Cataulacini** Emery

Cataulacus F. Smith. (Ethiopian, Malagasy, Indomalayan, Papuan). I cannot recognize *Otomyrmex* Forel as a valid subgenus since it was based merely on the pointed, elongate occipital angles of the head, a character which is found, more or less pronounced, among many species of *Cataulacus*.

18. **Cryptocerini** F. Smith

☿

1. Antennal scrobes approximated in front, diverging strongly behind, not reaching the sides of the head except at their extremities. Monomorphic. (Neotropical)........**Procryptocerus** Emery.

Antennal scrobes covered throughout their length by the lateral border of the head.......................................2.

2. Much flattened. Sides of the head, the thorax, the epinotum and the first tergite of the gaster excessively expanded into broad, translucent lamellæ; the eyes almost stalked above the very deep scrobes. Monomorphic. (Neotropical). **Zacryptocerus** Ashmead.

Sides of the body not with extremely expanded, translucent lamellæ...3.

3. Eyes more prominent, exposed when the head is seen from above. Posterior angles of the head, pronotum, and epinotum with long, erect spines. Black, monomorphic, moderately flattened species. (Neotropical)...... ......**Cephalotes** Latreille.

Eyes less prominent, usually hidden by the lateral carinæ when the head is seen from above. Body flattened, the spines usually broad and short, directed sidewise. (Neotropical, southern Nearctic)..........................**Cryptocerus** Fabricius.

a. Monomorphic. Pronotum without transverse crest. Spines of the epinotum long and sharp. Subgenus **Hypocryptocerus** Wheeler. (Type: *Formica hæmorrhoidalis* Latreille; Haiti).

Strongly dimorphic. Pronotum usually with a more or less distinct crest.*b*.

b. Head surmounted by a concave, saucer-shaped structure in the soldier *c*.

Head of the soldier without saucer-shaped structure, distinctly convex above Subgenus **Paracryptocerus** Emery

c. Saucer-shaped structure of the head of soldier more complete, bordered by a continuous raised lamella in front and behind; the head concave above. Gaster more elongate Subgenus **Cyathocephalus** Emery.

Saucer-shaped structure of the head of soldier much less pronounced, incompletely margined; the head still convex above Gaster more oval Subgenus **Cryptocerus**, *sensu stricto*.

19. **Dacetonini** Forel

☿

1. Antennæ 12-jointed. Antennal scrobes as long as the scape, placed at the lateral side of the eyes. Mandibles narrowly triangular, with numerous fine teeth along the apical margin. Body hairs partly scale-like. (Neotropical).
Basiceros Schulz (= *Ceratobasis* F. Smith).

Antennæ 11-jointed. Antennal scrobes short .... 2.

Antennæ 4- to 8-jointed .... 3.

2. Only the last joint of the funiculus longer than the preceding joint. (Neotropical) .... **Daceton** Perty.

The two last joints of the funiculus longer than the preceding. Mandibles elongate, slender, parallel and porrect, with three hook-like, curved teeth at the apex; with a very long tooth directed inward at the under side near the base. Pedicel without spongiform appendages. Body hairs not scale-like. (Neotropical) .... **Acanthognathus** Mayr.

3. Antennæ 4-jointed; the terminal joint of the funiculus as long as, or longer than, the two basal joints. Mandibles slender, porrect, subparallel. Pedicel often with spongiform appendages. (Mediterranean, Ethiopian, Papuan, Australian, Neotropical).
Epitritus Emery.

Antennæ 5-jointed .... 4.

Antennæ 6- to 8-jointed .... 5.

4. Antennal scrobes shallow, placed at the dorsal or medial side of the eyes. Second joint of the funiculus much elongate, longer than the apical joint. Mandibles slender, porrect, parallel. Pedicel without spongiform appendages. (New Zealand, Australian, Papuan) .... **Orectognathus** F. Smith.

Antennal scrobes deep, placed at the dorsal side of the eyes. The three basal joints of the funiculus subequal, together not longer than the apical joint. Mandibles short, narrowly subtriangular, with small teeth along their apical margin. Pedicel with spongiform appendages. (Formosa) .. **Pentastruma** Forel.

5. Antennæ 7- or 8-jointed, the apical joint of the funiculus the largest. Mandibles denticulate along the inner or apical margin; either long, porrect and with curved apex; or narrowly triangular. Antennal scrobes placed at the lateral side of the eyes. Body hairs partly scale-like or clavate. (Neotropical, Indomalayan, Papuan, Australian) .... **Rhopalothrix** Mayr.

a. Antennæ 7-jointed . . . . Subgenus **Rhopalothrix**, *sensu stricto*.
Antennæ 8-jointed . . . . Subgenus **Octostruma** Forel.

Antennæ 6-jointed . . . . 6.

6. No antennal scrobes. The frontal carinæ form two anterior lobes which cover the base of the scape, but are not prolonged behind. The scape lies against the head at the dorsal side of the eye. Occipital angles of the head with 3 spines on the upper face. Mandibles slender, porrect, parallel, with three apical teeth. Petiole spinose above; postpetiole very broad. No spongiform appendages. (Ethiopian) . . . . **Microdaceton** Santschi.

Antennal scrobes more or less developed, often very strongly so. Occipital angles of the head unarmed . . . . 7.

7. Antennal scrobes situated at the lateral side of the eyes; the latter being placed upon or above the upper margin of the scrobes. (Papuan, Australian) . . . . **Epopostruma** Forel.

Antennal scrobes placed at the dorsal or medial side of the eyes . . . 8.

8. Antennal scrobes very deep, bordered also over their whole length by a strong lower ridge immediately above the eyes, and accommodating both scape and funiculus. Lateral margins of the head forming with the expanded frontal carinæ and the external borders of the clypeus a translucent plate overarching the scrobe on each side. Mandibles short and broad, the apical margin broad, with a regular row of acute teeth. Anterior margin of the clypeus excised. Funiculus with 2-jointed club; the apical joint nearly as long as the remainder of the funiculus. Abdomen with fungiform appendages. Body hairs not clavate nor scale-like. Antennæ 13-jointed in the male. Wing venation much reduced in both sexes. (Neotropical).
Glamyromyrmex Wheeler.

Antennal scrobes usually not so pronounced or of different shape. Head, clypeus, and mandibles also different . . . . 9.

9. Head subtriangular, with convexly swollen vertex, not strongly narrowed in front. Clypeus projecting over the base of the mandibles. Antennal scrobes broad, overarched by the much expanded frontal carinæ which continue backward as far as the posterior corners of the head. Mandibles large, swollen, subtriangular; their apical margin with numerous, regular, acute teeth. Spongiform appendages of the abdomen well developed. Squamiform or clavate hairs absent. (Trinidad).
Codiomyrmex Wheeler.

Head usually with narrowed, snout-like anterior portion. Frontal carinæ not reaching the posterior corners of the head. Mandibles slender and porrect, or narrowly subtriangular and flattened. Spongiform appendages of the abdomen present or absent. Body hairs often partly scale-like or clavate. (Mediterranean, Japan, Ethiopian, Malagasy, Indomalayan, Papuan, Polynesian, New Zealand, Neotropical, Nearctic).
Strumigenys F. Smith.

a. Mandibles slender, porrect, subparallel; with two or three teeth at the apex; approximate at their base, which is not covered by the short clypeus. . . . . .Subgenus **Strumigenys**, *sensu stricto*.

Mandibles rather short and flattened, narrowly subtriangular; with numerous small teeth along their apical margin; remote at their base, which is covered by the projecting clypeus.
Subgenus **Cephaloxys** F. Smith (= *Trichoscapa* Emery).

20. **Stegomyrmicini**, new tribe

Stegomyrmex Emery. (Neotropical).

21. **Proattini** Forel

Proatta Forel. (Sumatra).

22. **Attini** F. Smith[1]

☿

1. Antennæ with a well-defined 2-jointed club, which is longer than the remainder of the funiculus. A deep antennal scrobe extends the full length of the head, bordered above by the frontal carinæ and below by a ridge as long as the frontal carinæ and running just above the eye. Frontal carinæ very far from each other, expanded, lobulate in front. Body hairs very sparse, long, stiff and blunt. Mandibles 4-toothed. Monomorphic. Male and female unknown. (Neotropical).
Blepharidatta Wheeler.

Antennæ without distinct 2-jointed club. Antennal scrobes indistinct or short . . . . .2.

2. Frontal carinæ very close to each other and dilated at the anterior extremity. Clypeus not distinctly prolonged between them. Monomorphic . . . . .3.

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[1] *Pseudoatta* Gallardo (1916, An. Mus. Nac. Buenos Aires, XXVIII, p. 320), for *Pseudoatta argentina* Gallardo, is only known in the female and male sex; there are probably no workers, this ant thus being a possible social parasite of some other Attini. Antennæ 11-jointed in female and male; frontal carinæ separated, broadened at the anterior extremity into lobes which cover the insertion of the antennæ; mandibles subtriangular, many-toothed; integument even, shining, almost without sculpture, with short, thick hairs. Argentina.

Frontal carinæ separated, embracing the posterior extremity of the clypeus . . . . 5.

3. Integument bristling with tubercles and spines, with hooked and scale-like hairs. (Neotropical).
Myrmicocrypta F. Smith (=*Glyptomyrmex* Forel).

Integument opaque and even . . . . 4.

4. Body slender and elongate, covered with long soft, fine, woolly hairs. (Neotropical) . . . . **Apterostigma** Mayr.

Body not slender, with very poorly developed pilosity. (Neotropical) . . . . **Mycocepurus** Forel.

5. Hairs of the body appressed, rather scale-like. Antennal foveæ usually prolonged to the posterior corners of the head. Body with few spines. Monomorphic. (Neotropical, Nearctic).
Cyphomyrmex Mayr.[1]

Body bearing erect hairs, which are often coarse . . . . 6.

6. Integument even, bearing only delicate, oblique, flexuous hairs. Body with very few spines. Monomorphic. (Neotropical).
Sericomyrmex Mayr.

Integument rough, bearing stiff or hooked hairs. Body often with spines or tubercles . . . . 7.

7. Monomorphic. Fungus gardens pendant in the nest. (Neotropical, Nearctic) . . . . **Trachymyrmex** Forel.

a. Anterior lobes of the frontal carinæ moderately broad. Larger species.
Subgenus **Trachymyrmex**, *sensu stricto*.

Frontal carinæ ending in very broad, anterior lobes. Smaller species. (Texas) . . . . Subgenus **Mycetosoritis** Wheeler.

Polymorphic. Fungus gardens sessile on the floor of the chambers of the nest. (Neotropical, southern Nearctic) . . **Atta** Fabricius.

a. Strongly polymorphic. Very large species . . Subgenus **Atta**, *sensu stricto*.

Feebly polymorphic. Smaller species . . . . *b*.

b. No postocular tubercles or spines. Head broadly, strongly cordate, with the occipital lobes prominent and rounded, often spinose. Mandibles short, feebly curved on the plate and with their lateral margin not distinctly sinuate . . . . Subgenus **Mœllerius** Forel.

Postocular spines well developed or at least represented by a tubercle.
Subgenus **Acromyrmex** Mayr.

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[1] Emery's subgenera *Mycetarotes* and *Mycetophylax* (1913, Ann. Soc. Ent. Belgique, LVII, p. 251), have not yet been characterized.

Pheidolini, Myrmecinini, Solenopsidini, Leptothoracini, and Tetramoriini

As may be seen from the key, p. 659, the characters used by Emery to separate these five tribes are to a very large extent taken from the winged forms. Since the workers are more frequently met with, I have combined the genera of these five tribes into one synoptical table based on the worker phase.

In the following genera social parasitism is so advanced that the worker has disappeared and only the female and male have remained; in a few cases the male is unknown: *Anergates* Forel, *Anergatides* Wasmann, *Epipheidole* Wheeler, *Epixenus* Emery, *Epœcus* Emery, *Hagioxenus* Forel, *Parapheidole* Emery, *Sifolinia* Emery, *Sympheidole* Wheeler, *Trichomyrmex* Mayr, and *Wheeleriella* Forel. These genera do not appear in the key. Other parasitic forms (*Strongylognathus, Harpagoxenus, Formicoxenus, Epimyrma*), where workers are still present, have been included here.

The worker of *Trichomyrmex* Mayr (Ceylon) is unknown; this genus has been omitted from the key.

☿, ♃ (when present).

1. Antennæ 12-jointed..2.
   Antennæ 11-jointed..36.
   Antennæ 7- to 10-jointed..60.
2. Club of the antennæ 2-jointed, the last joint much larger than the others. Epinotum bispinose. Hind tibiæ without spurs....3.
   Antennal club indistinct or shaped differently..................5.
3. Anterior margin of the clypeus broadly rounded. Head with deep lateral scrobes, large enough to enclose the whole antennal scape. Mesoëpinotal constriction pronounced. Inferior pronotal angles rounded. Body covered with long, flexuous hairs. Male and wings of female unknown. Antennæ 12-jointed in the female. (Neotropical). **Lachnomyrmex** Wheeler.
   Anterior margin of the clypeus with a projecting, median piece. Head without deep, lateral scrobes. Mesoëpinotal constriction feeble..4.
4. Clypeus strongly projecting into a median, truncate lobe, which is distinctly separated from the frontal carinæ. Inferior angles of the epinotum pointed or rounded. Antennæ 12-jointed in the female; wings unknown. Male unknown. (Papuan).
   Adelomyrmex Emery.

a. Inferior angles of the epinotum pointed. Clypeus with a bidentate median lobe. . . . . .Subgenus **Adelomyrmex**, *sensu stricto*.

Inferior angles of the epinotum rounded. Clypeus with a quadridentate median lobe.

Subgenus **Arctomyrmex** Mann. (Type: *Arctomyrmex hirsutus* Mann).

Clypeus elevated in the middle to form a narrow, bidentate plate, which is fused with the frontal carinæ. Inferior angles of the epinotum rounded. Male and female unknown. (Neotropical). **Apsychomyrmex** Wheeler.

5. Erect hairs of the body usually trifid or multifid. Antennal club 3-jointed. Distinct antennal scrobes divided by a longitudinal carina into two halves for the reception of the folded scape and funiculus. Thoracic sutures obsolete. Epinotum armed. Petiole and postpetiole (or at least the latter) much wider than long, the petiole never squamiform. Fore wings with one closed cubital and a closed radial cell. Antennæ 12-jointed in the female, 10-jointed in the male. (Ethiopian, Malagasy, Indomalayan, Papuan). . . . . **Triglyphothrix** Forel.

Hairs of the body simple, rarely clavate. . . . . 6.

6. Eyes prolonged obliquely downwards. Antennal club 4-jointed. Thoracic sutures distinct. Petiole pedunculate in front. Epinotum spinose. Workers monomorphic. Fore wings with two closed cubital cells. Antennæ 12-jointed in the female, 13-jointed in the male. (Mediterranean). . . . **Goniomma** Emery.

Eyes round or oval. . . . . 7.

7. Posterior margin of the clypeus raised laterally in the form of trenchant ridges which border the antennal foveæ in front. . 8.

Posterior border of the clypeus not forming ridges. . . . . 15.

8. Mandibles narrow and pointed, without distinct basal and apical border. Antennal club 3-jointed. Most other characters of all phases as in *Tetramorium*, with which genus these ants form mixed colonies. (Central and southern Europe).
Strongylognathus Mayr.

Mandibles subtriangular, with dentate apical border. . . . . 9.

9. Portion of the clypeus in front of the antennal insertion narrow, but not reduced to a mere ridge. Antennæ of the male usually 10-jointed (12- or 13-jointed in a few *Tetramorium*) . . . . 10.

Portion of the clypeus in front of the antennal insertion reduced to a trenchant ridge. . . . . 13.

10. Antennal foveæ small, never forming scrobes, the frontal carinæ short. Head wider behind than in front, the sides convex. . 11.

Frontal carinæ either short or long, often bordering distinct antennal scrobes. Head with subparallel or feebly convex sides..12.

11. Epinotum with long, diverging spines. (Indomalayan). **Acidomyrmex** Emery.

Epinotum unarmed. First joint of petiole usually laterally compressed. (Ethiopian)..............**Rhoptromyrmex** Mayr.

12. Antennal club 4-jointed. Clypeus bidentate. (Neotropical). **Lundella** Emery.

Antennal club 3-jointed. Clypeus usually unarmed. Antennæ as a rule 10-jointed in the male, the second funicular joint greatly lengthened. (Tropics and warm temperate regions, especially of the Old World)..................**Tetramorium** Mayr.

13. Petiole not pedunculate in front. Workers without appreciable dimorphism. (Holarctic, Indomalayan, Papuan, Australian). **Myrmecina** Curtis.

Petiole pedunculate in front...............................14.

14. Worker caste very markedly dimorphic. In soldier and worker, the petiole is strongly bidentate above and the epinotum is armed with two spines. Worker also with two spines on the pronotum. (Indomalayan, Papuan)..........**Acanthomyrmex** Emery.

Worker caste monomorphic. Pronotum not spinose (see below). **Eutetramorium** Emery.

15. Workers monomorphic or dimorphic, in the latter case the extreme forms are usually connected by intermediates and the antennal club is either 4- or 5-jointed, or shorter than the remainder of the funiculus; or the antennal club indistinct...........16.

Workers with very pronounced dimorphism, in very few cases with intermediates between workers and soldiers. Antennal club distinct, 3- or 4-jointed, longer than the remainder of the funiculus. Sting very feeble. Soldier: head very large; mandibles convex, large, their apical margin usually with one basal and two terminal teeth, without teeth in the middle. Fore wings with two closed cubital cells. Antennæ 12-jointed in the female, 13-jointed in the male; in the latter the first joint of the funiculus very short, globose. (Tropicopolitan, southern Palearctic, Nearctic)..........**Pheidole** Westwood.

a. Mesonotum produced behind as a short, lamellate plate. Epinotal spines long and erect, obliquely truncate or bifurcate at tips. Head distinctly margined. (Papuan)..........Subgenus **Electropheidole** Mann.

Mesonotum of ordinary form. Epinotal spines not truncate or bifurcate at tips. . . . . *b.*

b. Pronotum of soldier and worker with a pair of spines. (Indomalayan, Papuan, Australian). . . . . . Subgenus **Pheidolacanthinus** Smith.

Pronotum unarmed. . . . . *c.*

c. Club of the antennæ much shorter than the remainder of the funiculus. Head of the male rounded behind, the ocelli placed on the vertex, which does not overarch the occiput. (Neotropical).
Subgenus **Macropheidole** Emery.

Club of the antennæ not much shorter, sometimes even longer, than the remainder of the funiculus. . . . . *d.*

d. Club of the antennæ thick and compressed, its terminal joint much larger than the others. Promesonotum depressed, the promesonotal suture obsolete. Large soldiers and minor (true) workers very different, but intermediates also present. (Australian).
Subgenus **Anisopheidole** Forel.

Not agreeing in all these charcaters. . . . . *e.*

e. Frontal carinæ of the soldier remote, but not divergent, with a lateral lobe covering the insertion of the scape. Back of the head without transverse wrinkles. Scape of the worker reaching considerably beyond the occipital border. Terminal joint of the antennal club much shorter than the two preceding joints together. (Indomalayan).
Subgenus **Stegapheidole** Emery.

Frontal carinæ of the soldier remote and divergent, not broadened laterally, extending at least to the tip of the scape. Scape of the worker not reaching beyond the occipital border. (Neotropical, Nearctic). . . . *f.*

Not agreeing in all these characters. . . . . *g.*

f. Head of the soldier shining, at least for the greater part; with one or more transverse wrinkles which separate the vertex from the occiput. Terminal joint of the antennæ longer than the two preceding together.
Subgenus **Elasmopheidole** Emery.

Head of the soldier dull, densely sculptured all over. Last joint of the antennæ not longer than the two preceding together.
Subgenus **Scrobopheidole** Emery.

g. Head of the soldier covered with a rough, vermiculate sculpture. Scape very thick, strongly bent at the base.
Subgenus **Trachypheidole** Emery.

Not agreeing in all these characters.
Subgenus **Pheidole**, *sensu stricto.*

Forel has also proposed a subgenus *Allopheidole* (type: *Pheidole kingi* Ern. André) and Wheeler a subgenus *Cardiopheidole* (type: *Pheidole vasliti* Pergande) both of which are rejected by Emery.

16. Petiole armed above with one or two spines (in a few species the node is merely angular in front). . . . . 17.

Petiole unarmed, not angular above . . . . 19.

17. Petiole with a single spine or erected tooth or merely angular. Clypeus bicarinate. Frontal carinæ often as long as the scape, the antennal foveæ deep or scrobe-like. Dorsal sutures of the thorax obsolete; epinotum bispinose. Female unknown. (Papuan, Australian) . . . . **Lordomyrma** Emery.

Petiole as a rule with two spines or teeth above. Fore wings with one closed cubital and a closed radial cell . . . . 18.

18. Monomorphic. Frontal carinæ as long as the antennal scape, subparallel, bordering feeble scrobes. Head often angulated behind. Angles of the pronotum pointed. Epinotum unarmed or with two spines. Mesoëpinotal suture usually deeply impressed. Male: antennæ 13-jointed; fore wings without intercubitus (type of *Formica*). Female unknown. (Ethiopian, Malagasy) . . . . **Terataner** Emery.

Polymorphic. Posterior angles of the head and humeral angles rounded. Epinotum bispinose. Frontal carinæ much shorter than the antennal scape in the small worker; about as long in the worker major where they border feeble scrobes. Female and male: antennæ 12-jointed; fore wings with intercubitus (*Solenopsis* type). (Ethiopian) . . **Atopomyrmex** Ern. André.

19. Middle of the clypeus slightly projecting in an angle[1] . . . . 20.

Clypeus not angular in front (feebly so in *Heteromyrmex*), sometimes bidentate, or with a median, projecting, truncate lobe . . 21.

20. Epinotum unarmed, with a median posterior impression which can receive the petiole. Antennæ with a 3-jointed club. Integument in great part shining. Female and male unknown. (Neotropical) . . . . **Megalomyrmex** Forel.

Epinotum bispinose. Antennæ thick, with indistinct club. Wings of the female unknown. Male unknown. (Malagasy).
Eutetramorium Emery.

21. Clypeus usually armed with two longitudinal ridges (sometimes rather feeble), which often project forward in the form of teeth. Rarely the anterior margin of the clypeus has no teeth, but then the epinotum is unarmed. Mesoëpinotal suture marked. Club of the antennæ 3-jointed, about as long as the remainder of the funiculus; rarely 4-jointed . . . . 22.

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[1] In *Heteromyrmex* the clypeus is very feebly projecting in the middle, but in this genus the epinotum is unarmed, though not impressed in the middle behind.

Clypeus not bicarinate, rarely toothed; if so the mesoëpinotal suture is usually indistinct. When with longitudinal clypeal ridges and distinct thoracic sutures, the club of the antennæ is 4- or 5-jointed or indistinct, and the last three joints are much shorter than the remainder of the funiculus........24.

22. Head and thorax more or less sculptured, usually with series of punctures. Clypeus bicarinate, with a median, rather broad, longitudinal groove. Epinotum unarmed or bispinose. Thorax somewhat depressed and flat above. Antennæ 12-jointed in the female, 13-jointed in the male. Mandibles of the female normally dentate along the apical margin. Fore wings with one closed cubital and an open radial cell. (Indomalayan, Papuan, Malagasy, southern Japan).

Vollenhovia Mayr.

Head and thorax smooth and shining, or very feebly sculptured. 23.

23. Worker: clypeus only bicarinate in its basal portion; its anterior margin feebly projecting in the middle; femora much swollen; head and thorax depressed; epinotum unarmed; smooth and shining. Female: much larger than the worker; postpetiole with a prominent spine on the ventral surface; femora much thickened; mandibles large, their apical margin broadly excised and toothless in the middle; antennæ 12-jointed; fore wings with one closed cubital and an open radial cell. Male unknown. (Borneo, Simalur).

Heteromyrmex Wheeler. (Genotype: *Vollenhovia rufiventris* Forel).

Worker: clypeus usually bicarinate throughout; femora moderately swollen; head and thorax not depressed; epinotum unarmed or bispinose. Female: mandibles normal, with the apical margin dentate throughout; antennæ 12-jointed; fore wings with one closed cubital and a closed radial cell. Male: antennæ 13-jointed.[1] (Tropicopolitan; also in warm temperate regions, especially in the Old World; in the Nearctic Region to southern New England).

Monomorium Mayr (part).

a. Eyes absent. Antennæ 10-jointed. Clypeus unarmed. (Ceylon).

Subgenus **Anillomyrma** Emery. (Type: *Monomorium decamerum* Emery).

Eyes present, rarely vestigial. Antennæ 11- or 12-jointed ....*b.*

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[1] Viehmeyer has recently described a subgenus *Corynomyrmex* (type: *Monomorium (Corynomyrmex) hospitum* Viehmeyer, from Singapore) of which only female and male are known. In the male the antennæ are 12-jointed with a 5-jointed club, the scape long, the first funicular joint longer and thicker than the succeeding; the author believes that this is a parasitic form without worker. This subgenus is not included in the key.

b. **Antennæ 11-jointed**..........*c*.
Antennæ 12-jointed..........*e*.

c. Clypeus strongly dentate. Epinotum more or less armed.
Subgenus **Martia** Forel. (Type: *Monomorium* (*Martia*) *vezényii* Forel).
Clypeus and epinotum unarmed..........*d*.

d. **Head, pro- and mesonotum sculptured.**
Subgenus **Adlerzia** Forel. (Type: *Monomorium* (*Adlerzia*) *froggatti* Forel).
Head, pro- and mesonotum smooth....Subgenus **Lampromyrmex** Mayr (= *Mitara* Emery). (Type: *Lampromyrmex gracillimus* Mayr = *Monomorium mayrianum* Wheeler, of the Baltic amber).

e. Antennal club with indeterminate number of joints, the joints of the funiculus gradually increasing in length and in width from the fifth to the tenth. Mesonotum of male with Mayrian furrows.
Subgenus **Chelaner** Emery. (Type: *Monomorium* (*Chelaner*) *forcipatum* Emery).
Antennal club 3- or 4-jointed..........*f*.

f. Eighth funicular joint distinctly larger than the seventh but much smaller than the ninth so that the club is doubtfully 4-jointed. Fore wings **with a discoidal cell.**
Subgenus **Notomyrmex** Emery. (Type: *Myrmica antarctica* F. Smith).
Antennal club indistinct or distinctly 3- or 4-jointed..........*g*.

g. Antennal club 3-jointed; the first joint being very short and smaller than the second; the terminal at least as long as the two preceding together.
Subgenus **Monomorium**, *sensu stricto*. (Type: *Monomorium minutum* Mayr).
The two basal joints of the club subequal..........*h*.

h. Antennal club much shorter than remainder of funiculus, often indistinct. Workers strongly dimorphic. Scape of male antennæ short; first funicular joint globular; remainder of funiculus growing more tenuous **towards its tip**
Subgenus **Holcomyrmex** Mayr. (Type: *Holcomyrmex scabriceps* Mayr).
Antennal club not much shorter than the remainder of the funiculus; or the worker not at all dimorphic..........*i*.

i. Clypeal carinæ feeble and converging behind, fused in front, lobes of the frontal carinæ closely approximated. Eyes vestigial. Antennal club 3-jointed; terminal joint much larger than the two preceding joints together. Epinotum unarmed. Peduncle of petiole long.
Subgenus **Syllophopsis** Santschi. (Type: *Monomorium modestum* Santschi).
Carinæ of clypeus and lobes of the frontal carinæ shaped differently. **Eyes usually distinct**..........*j*.

j. Workers slightly dimorphic. Antennal club 3-jointed with the two first joints equal or subequal. Male antennæ as in *Holcomyrmex*.
Subgenus **Parholcomyrmex** Emery. (Type: *Myrmica gracillima* F. Smith).
Workers not at all dimorphic; antennal club 3- or 4-jointed..........*k*.

k. **Antennal club 3-jointed**..........*l*.
Antennal club 4-jointed.
Subgenus **Isolcomyrmex** Santschi. (Type: *Monomorium santschii* Forel).

l. Clypeus of the worker more truncated anteriorly. Scape of male antennæ short. Fore wings with a discoidal cell. Diet exclusively granivorous.

Subgenus **Equestrimessor** Santschi. (Type: *Monomorium chobauti* Emery).
Clypeus of the worker less truncated. Scape of male antennæ longer than in *Parholcomyrmex;* the first funicular joint globular; the remaining joints not growing more tenuous towards the tip. Fore wings without a discoidal cell. Diet partly carnivorous.
Subgenus **Xeromyrmex** Emery. (Type: *Formica salomonis* Linnæus).

24. Inferior angles of the pronotum pointed. Club of the antennæ 3-jointed, about as long as the remainder of the funiculus. Hind tibiæ with small spurs. Epinotum bispinose. Body hairs simple. Male and wings of the female unknown. (Neotropical and Papuan)[1]........................**Rogeria** Emery.

a. Petiole clavate. Episternal angles spinose. First two joints of the antennal club subequal........................Subgenus **Irogera** Emery.
Petiole not clavate. Episternal angles blunt. First two joints of the antennal club unequal ....Subgenus **Rogeria**, *sensu stricto*.

Inferior angles of the pronotum rounded (except in certain *Aphænogaster* where they are spinose, but then the antennal club is not 3-jointed nor as long as the rest of the funiculus; in certain *Leptothorax* the humeri are pointed, but then the body hairs are clavate)..25.

25. Postpetiole campanulate, attached throughout by means of its whole posterior surface to the following segment. Thoracic dorsum usually without sutures or impressions. (Neotropical).
Macromischa Roger.

a. Head quadrate. Pedicel short and stout. Hypogæic. (Cuba).
Subgenus **Antillæmyrmex** Mann. (Type: *M. (Antillæmyrmex) terricola* Mann).
Head not quadrate, or the pedicel more slender .... b.
b. Thorax elongate. Epinotum unarmed. (Cuba).
Subgenus **Crœsomyrmex** Mann. (Type: *M. (Crœsomyrmex) wheeleri* Mann).
Thorax shorter, or the epinotum spinose.
Subgenus **Macromischa**, *sensu stricto*.

Postpetiole distinctly constricted posteriorly ....26.

26. Frontal carinæ as long as the antennal scape, strongly diverging behind. Epinotum unarmed. Female and male unknown. (Indomalayan, Papuan).
Dilobocondyla Santschi (= *Mesomyrma* Stitz).

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[1] *Theryella* Santschi (1921, Bull. Soc. Hist. Nat. Afr. Nord, XII, p. 68) is allied to *Rogeria*. Worker: clypeus very narrow in front of the insertion of the antennæ and deeply wedged between the frontal lobes, which are deflected to partly cover the base of the scape; antennæ 12-jointed, with a 3-jointed club as long as the remainder of the funiculus; mandibles triangular, dentate; eyes minute; promesonotal suture obsolete; metanotal groove present; epinotum bispinose; petiole and postpetiole as in *Pheidole*; gaster short. (North Africa; type *Theryella myops* Santschi).

Frontal carinæ much shorter than the antennal scape[1] ....27.

27. The last three joints of the antennæ form together a club, as a rule about as long as the rest of the funiculus. Erect hairs of the body often more or less clavate. Epinotum usually bispinose. 28.

The last three joints of the antennæ are much shorter than the funiculus; club 4- or 5-jointed, or not very distinct. Hairs of the body not clavate ....30.

28. Clypeus with a fine longitudinal carina. Body hairs feebly clavate. Postpetiole with a small tooth below. Female winged, with 12-jointed antennæ. Male: antennæ 13-jointed. Fore wings with one closed cubital, an open radial and no discoidal cell. (Siberia; parasite of *Leptothorax*)....**Myrmoxenus** Ruzsky.

Clypeus not carinate. Postpetiole not toothed ventrally. Fore wings with one closed cubital and a closed discoidal cell..29.

29. Antennæ long and slender, the 3-jointed club much shorter than the remainder of the funiculus. Legs long and slender. Thorax elongate; pronotum on each side above with a bluntly angular elevation. Peduncle of petiole long and slender; the node compressed antero-posteriorly. Erect hairs of the body simple, pointed. Male with 11-jointed antennæ, the third funicular joint often incompletely separated from the second. Fore wings with a closed radial cell. (Ethiopian).
Macromischoides Wheeler.

Antennæ shorter, the 3-jointed club about as long as the rest of the funiculus. Pronotum without blunt elevation above on the sides. Erect hairs of the body often clavate and microscopically denticulate. Male with 12- or 13-jointed antennæ. Fore

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[1] The following two genera should be considered here; they are very imperfectly defined and without a study of specimens it seems impossible to include them in the key in a satisfactory manner.

Brunella Forel includes only a Malagasy species described originally as *Aphænogaster belti* Forel: "this genus differs from *Aphænogaster* in its 3-jointed club and in the flattened thorax of the female; from *Atopula* in the very long anterior peduncle and the rounded node of the petiole, also in the more convex thorax of the worker. In many respects it resembles the American *Macromischa*." (Forel, 1917, Bull. Soc. Vaudoise Sc. Nat., LI, p. 234.)

***Atopula* Emery.** "**Worker:** much like *Vollenhovia* in habitus and sculpture; varies little in size; head lengthened, posterior angles rounded; frontal carinæ much shorter than the scape; thorax elongate, the promesonotal suture obsolete, pronotum with blunt humeral angles; epinotum with two strong but blunt teeth; petiole pedunculate anteriorly, with a raised node behind; gaster elongate, oval; femora feebly swollen. Female: slightly larger than the worker; head and thorax about as in the latter; wings with a closed radial cell; cubital vein connected with the radial by means of a long transverse nervure, discoidal cell present; the wings are described after *A. ceylonica*. Male unknown." (Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 104). Emery included originally two species: *nodifera* Emery of Cameroon and *ceylonica* Emery of Ceylon and Malay Archipelago; but Forel wants *Atopula* restricted to the Ethiopian *nodifera* Emery.

The species *ceylonica* Emery was originally described as *Atopomyrmex*. Emery transferred it to *Atopula* and more recently Forel considers it to be a *Leptothorax*. Since I cannot agree with this allocation, I have recently proposed a new genus, *Paratopula*, for this species.

wings with an open or closed radial cell. (Palearctic, Ethiopian, Malagasy, Nearctic, Neotropical, Indomalayan).
Leptothorax Mayr (part).

a. Worker and female with pronounced humeral angles. Radial cell of fore wings short and closed . . . . *b.*
Worker and female with the humeri rounded. Radial cell of the fore wings either short and closed or elongate and open . . . . *c.*
b. Antennæ 11-jointed in female and worker; 12-jointed in the male. (Neotropical) . . Subgenus **Nesomyrmex** Wheeler (= *Caulomyrma* Forel).
Antennæ 12-jointed in female and worker; 13-jointed in the male. (Neotropical, Ethiopian, Malagasy).[1] . . . Subgenus **Goniothorax** Emery.
c. Antennæ 11-jointed in female and worker; 12-jointed in the male. Erect hairs of the body stiff, thickened, truncate at the apex. (Holarctic).
Subgenus **Mychothorax** Ruzsky.
Antennæ 12-jointed in female and worker; 13-jointed in the male . . . *d.*
d. No mesoëpinotal constriction. Erect hairs of the body thick, stiff, truncate at the apex. (Holarctic). Subgenus **Leptothorax**, *sensu stricto*.
Mesoëpinotal constriction present . . . . *e.*
e. Erect hairs of the body soft, long and simple. Fore wings of female and male with a short, closed radial cell. (Mediterranean).
Subgenus **Temnothorax** Mayr.
Erect hairs of the body slightly thickened, obtuse. Fore wings of male and female with an elongate, open radial cell. (Nearctic).
Subgenus **Dichothorax** Emery.

30. Median area of the clypeus somewhat produced in front, the anterior margin straight, with a longitudinal, shallow impression in the middle. Antennal club 3- or 4-jointed. Thorax unarmed, with feeble sutures; deeply depressed at the mesoëpinotal suture. Petiole pedunculate. Female wingless, ergatoid, with 12-jointed antennæ. Male unknown. (South Africa) . . . . **Tetramyrma** Forel.
Clypeus of different shape . . . . 31.

31. Antennæ distinctly thickened, but the club not separated; the last four joints together not much shorter than the remainder of the funiculus. Eyes much reduced. Petiole with a long peduncle and a small node. Worker small, monomorphic. Fore wings with one closed cubital cell. (Holarctic).
Stenamma Westwood.
Antennæ usually filiform, the four last joints together much shorter than the remainder of the funiculus; or with a more or less distinct club . . . . 32.

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[1] *Poecilomyrma* Mann, of the Fiji Islands, is evidently related to *Goniothorax*, having the humeral angles spinose and the antennæ 12-jointed; only the worker is known. The inferior angles of the epinotum are very elongate and spinose. It may be regarded as a subgenus of *Leptothorax* (type: *Poecilomyrma senirewæ* Mann).

32. Antennæ with a distinct 4-jointed club. Strongly dimorphic; much as in *Pheidole*. (Neotropical, Indomalayan).
Ceratopheidole Pergande.
Antennæ without a club or with a 5-jointed club; or else the workers are monomorphic . . . . 33.

33. Workers monomorphic or without pronounced dimorphism . . . . . 34.
Workers dimorphic or polymorphic; soldiers with broad head . . 35.

34. Head elongate. Psammophore vestigial. Fore wings with one closed cubital cell. (Sonoran in North America).
Novomessor Emery.
Head elongate or rectangular or constricted behind. Psammophore rarely well developed. Mandibles with their external margin feebly convex. Male: antennæ with a 5-jointed club. Fore wings as a rule with two closed cubital cells. (Mediterranean, Malagasy, Indomalayan, Papuan, Australian, Nearctic, Neotropical) . . . . **Aphænogaster** Mayr.

a. Worker: head constricted behind, neck-like. Male and female: fore wings of the *Solenopsis* type, with one closed cubital cell . . . . *b.*
Worker: head not constricted into a neck; pronotum unarmed. Fore wings usually with two closed cubital cells. Antennæ of the male 13-jointed . . . . *c.*

b. Male: antennæ 12-jointed; a pair of spines on the mesonotum. Worker: thorax usually with four spines. (Papuan).
Subgenus **Planimyrma** Viehmeyer.
Male: antennæ 13-jointed; mesonotum unarmed. Worker: pronotum not spinose . . . . Subgenus **Deromyrma** Forel.

c. Female of very large size in proportion to the worker. Fore wings with one closed cubital cell. Nocturnal habits. (Australian).
Subgenus **Nystalomyrma** Wheeler.
Female not much larger than the largest worker form. Fore wings with one or two closed cubital cells. (Including the subgenus *Attomyrma* Emery) . . . . Subgenus **Aphænogaster**, *sensu stricto*.

35. Worker minor: psammophore not developed; head much contracted behind, neck-like. Soldier: head angularly excised behind. Two closed cubital cells. (Indomalayan).
Ischnomyrmex Mayr (= *Isopheidole* Forel).
Worker: psammophore well developed. Fore wings with one cubital cell. (Sonoran in North America) . . **Veromessor** Forel.
Worker: psammophore often well developed; mandibles broad, with their external margin strongly convex. Male: antennæ without distinct club. Fore wings with two closed cubital cells. (Palearctic, Ethiopian, northern India) . . **Messor** Forel.

36. Abdomen viewed from the side triangular, flat above, the apex of the triangle below. Epinotum with two strong spines recurved upwards. Thoracic sutures indistinct. Petiole with a long basal peduncle and a squamiform node; postpetiole articulated to the gaster by the whole of its posterior face. Head viewed from the side truncate anteriorly. Mandibles narrow, the apical margin with 4 teeth. Clypeus vertical, with two longitudinal ridges. Antennæ with a 3-jointed club. Female and male unknown. (Indomalayan)........**Trigonogaster** Forel.

Abdomen not triangular viewed from the side................37.

37. Eyes drawn into a point below. Antennæ with a 3- or 4-jointed club. Frontal carinæ short, straight. Thoracic sutures distinct. Epinotum spinose. Workers monomorphic. Antennæ 11-jointed in the female; 12-jointed and with a fairly distinct 4-jointed club in the male. Fore wings of the *Solenopsis* type, with one closed cubital cell. (Mediterranean).
Oxyopomyrmex Ern. André.

Eyes, when present, round or oval, not prolonged obliquely downwards..38.

38. Club of the antennæ 2-jointed, the last joint much larger than the others..39.

Antennal club indistinct or 3- to 5-jointed................43.

39. Thoracic sutures obsolete; a very feeble depression in front of the epinotum. Epinotum unarmed. Hind tibiæ without spurs. Eyes present. Monomorphic and probably parasitic. Female and male unknown. (Mediterranean)[1] ....**Phacota** Roger.

Mesoëpinotal suture strongly marked......................40.

40. Epinotum unarmed, or at most feebly bituberculate. Clypeus without carinæ. Eyes present. Ninth antennal joint conspicuously longer than the eighth, though much shorter and especially narrower than the tenth. Workers monomorphic. Antennæ 11-jointed with 3-jointed club in the female, 12-jointed in the male. Wings with one closed cubital and an open radial cell. (Ethiopian)...............**Diplomorium** Mayr.

Epinotum usually bidentate; rarely unarmed, but then the workers are strongly dimorphic.......................41.

41. Worker monomorphic. Eyes very small; ocelli absent. Female of enormous size compared with the worker, with 11-jointed

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[1] *Paraphacota* Santschi, of Tunis, is known only from the male and perhaps related to *Phacota*, though the male of the latter has never been described.

antennæ. Male with 13-jointed antennæ. Fore wings with one closed cubital and a closed radial cell, of the *Solenopsis* type. (Nearctic, Neotropical; fossil in Baltic amber).
Erebomyrma Wheeler.

Worker strongly dimorphic or polymorphic; soldier with very large head..42.

42. Head of the soldiers very broad. Ninth joint of the antennæ not distinctly longer than the eighth. Antennæ 11-jointed in the female, 13-jointed in the male. Largest soldiers and minor workers connected by intermediate forms. Fore wings with one closed cubital cell. (Indomalayan, Papuan, Australian; doubtfully Ethiopian)...............**Pheidologeton** Mayr.

a. Soldier and female: frontal carinæ very pronounced, overlapping the deep antennal scrobes and passing into each other on the vertex. Worker minor: head of more normal shape. (India).
Subgenus **Lecanomyrma** Forel.

Head of the soldier and female with feeble frontal carinæ, without scrobes.
Subgenus **Pheidologeton**, *sensu stricto*.

Soldiers with elongate head, which is more or less abruptly truncate behind. Eyes very small or absent. Clypeus usually more or less distinctly bicarinate. Soldiers and workers not connected by intermediate forms. (Indomalayan, Ethiopian).
Aneleus Emery.

43. Posterior lateral border of the clypeus raised in form of trenchant ridges, which border the antennal foveæ in front........44.

Antennal foveæ not bordered in front by ridges of the clypeus..46.

44. Portion of the clypeus in front of the antennal insertions reduced to a trenchant ridge. Antennæ thick, with 3-jointed club. Epinotum bispinose. Mesoëpinotal suture marked by a transverse carina, feebly or not impressed. Petiole pedunculate in front. (Japan, China, Indomalayan, Papuan, Australian).
Pristomyrmex Mayr.

a. Humeri of the pronotum unarmed. Subgenus **Pristomyrmex**, *sensu stricto*.

Humeri of the pronotum with spines...Subgenus **Odontomyrmex** Forel.

Portion of the clypeus in front of the antennal insertion narrow, but not reduced to a mere ridge..........................45.

45. Thoracic dorsum deeply impressed at the mesoëpinotal suture. Antennæ slender. Petiole pedunculate in front. (Papuan, Australian)..............................**Dacryon** Forel.

Thoracic dorsum feebly or not impressed at the mesoëpinotal suture, which however is distinct. Antennal scrobes usually well defined. Antennæ 11-jointed in the female, 10-jointed in the male. (Ethiopian, Malagasy, Indomalayan, Papuan, Australian, Nearctic)................. **Xiphomyrmex** Forel.

46. Eyes absent. Antennæ with a 3-jointed club. Epinotum unarmed. 47.

Eyes sometimes small, but quite distinct................... 48.

47. Postpetiole armed with a ventral spine. Monomorphic. Female much larger than the worker, with 11-jointed antennæ, wings with one closed cubital cell. Male unknown. (Indomalayan, Papuan)........... **Liomyrmex** Mayr (= *Promyrma* Forel).

Postpetiole not spinose ventrally. Monomorphic. Female moderately larger than the worker, with 11-jointed antennæ. Male: antennæ 12-jointed. Front wings with one closed cubital and an open radial cell. (Ethiopian[1]). **Bondroitia** Forel.

48. Thorax and petiole without any trace of teeth or spines; humeri of the pronotum never angular. Mesoëpinotal suture strongly impressed. Clypeus often bidentate in front. Antennal club 3-jointed.. 49.

Epinotum nearly always armed with teeth or spines at least in the worker major; when they are absent, the pronotum has angular humeri.. 51.

49. Monomorphic. Petiole not pedunculate in front. Clypeus projecting into a bidentate median lobe. Arboreal. Female and male unknown. (Neotropical).......... **Xenomyrmex** Forel.

Often polymorphic. Petiole distinctly pedunculate in front. Fore wings with one closed cubital and an open or closed radial cell. Antennæ 13-jointed in the male, 11-jointed in the female. 50.

50. Clypeus bicarinate or at least with faintly indicated carinæ. Eyes usually well developed. Female and worker moderately different in size (see key to subgenera above, p. 675). **Monomorium** Mayr (part).

Clypeus convex, without carinæ. Eyes small. Hypogæic. Great difference in size between worker and female. (Neotropical). **Tranopelta** Mayr.

51. Frontal carinæ parallel, as long as the antennal scape, bordering scrobe-like depressions. Mandibles strongly curved, without teeth. Antennal club 4-jointed. Petiole and postpetiole each

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[1] Forel has described as *Bondroitia coeca* a single worker supposedly collected near Geneva, Switzerland, which is hardly different from the African *Bondroitia lujæ* (Forel). It is very probable that the locality Geneva is erroneous and due to some mistake in labelling specimens.

with a ventral spine; petiole not pedunculate. Mesoëpinotal suture feebly impressed. Epinotum spinose. Fore wings with one closed cubital and a long, open radial cell, of the *Formica* type. Female: winged or apterous and ergatoid, with ocelli and 11-jointed antennæ. Male: with 12-jointed antennæ. In mixed colonies with *Leptothorax*. (Northern and Central Europe, Nearctic).

Harpagoxenus Forel (= *Tomognathus* Mayr).

Frontal carinæ much shorter than the scape. Mandibles usually toothed at the apical margin. Petiole and postpetiole rarely both with a ventral spine.............................52.

52. Thoracic dorsum distinctly or profoundly impressed at the mesoëpinotal suture. Monomorphic.......................53.

Thoracic dorsum little or not at all impressed at the mesoëpinotal suture; if with a deep suture, the worker caste is polymorphic. 57.

53. Humeri of the pronotum angular or toothed.................54.

Humeri of the pronotum rounded........................55.

54. Antennal club 3-jointed, at least as long as the remainder of the funiculus. Femora slender. Small species. Female and male unknown. (Indomalayan).........**Lophomyrmex** Emery.

Antennal club indistinct, the last three joints much shorter than the remainder of the funiculus. Femora much swollen in the middle. Arboreal, of medium or large size. (Australian, Papuan)..........................**Podomyrma** F. Smith.

55. Clypeus with two longitudinal ridges which terminate in strong teeth at the anterior margin. Petiole pedunculate at the base. (see above p. 675).................**Monomorium** (part).

Clypeus not bicarinate nor bidentate.......................56.

56. Front margin of the clypeus slightly emarginate in the middle. Petiole pedunculate at the base. Body hairs simple. Antennæ 11-jointed in the female, 12-jointed in the male. Female and male winged; fore wings with one closed cubital and an open radial cell. Nesting habits as in *Monomorium*. (New Zealand)................................**Huberia** Forel.

Front margin of the clypeus broadly rounded, entire. Petiole not pedunculate. Body hairs robust, frayed at their tips into several acute, microscopic processes. Female winged, with 11-jointed antennæ; venation unknown. Male ergatoid, wingless, with 12-jointed antennæ. Parasitic in *Myrmica* nests. (Nearctic).........................**Symmyrmica** Wheeler.

57. Erect body hairs usually clavate and denticulate; the body in great part opaque. Antennal club 3-jointed, longer than the remainder of the funiculus. Monomorphic.[1] . . . . 58.

Erect body hairs simple. Humeri of the pronotum rounded. Integument smooth and shining . . . . 59.

58. Petiole usually with a short peduncle, not expanded ventrally; postpetiole unarmed below. Humeri of the pronotum sometimes angular. Antennæ 12-jointed in the male (see p. 679). **Leptothorax** Mayr (part).

Petiole scarcely pedunculate in front, with a compressed expansion ventrally; postpetiole with an obtuse tooth below. Humeri of the pronotum rounded. Female winged, as in *Formicoxenus*. Male unknown. In mixed colonies with *Leptothorax*. (Mediterranean) . . . . **Epimyrma** Emery.

59. Workers strongly dimorphic. Petiole pedunculate, unarmed ventrally. Antennæ 11-jointed in the female, 12-jointed in the male. Fore wings with two closed cubital cells. (Australian). **Machomyrma** Forel.

Workers monomorphic. Petiole scarcely pedunculate in front. Postpetiole armed with a spine below. Female: 11-jointed antennæ; usually winged; fore wings with an open radial and one closed cubital cell, of the *Formica* type. Male ergatoid, wingless, with 12-jointed antennæ. In mixed colonies with *Formica*. (Northern and Central Europe). **Formicoxenus** Mayr.

60. Antennæ 10-jointed . . . . 61.

Antennæ 7- to 9-jointed. Antennal scrobes absent . . . . 66.

61. A deep and smooth antennal scrobe on each side of the face. Tibiæ and femora very strongly swollen. Lateral ridges of the clypeus obsolete. Much as *Tetramorium*. Antennæ 10-jointed in female and male. (Ethiopian) . . **Decamorium** Forel.

Antennal scrobes absent; the frontal carinæ short . . . . 62.

62. Antennæ 7- to 10-jointed, with the last joint very large; without 2-jointed club. Thorax without spines or teeth. Eyes present. Small, yellow. Nests in swellings of plants. (Neotropical). **Allomerus** Mayr.

Antennæ always 10-jointed. Usually a distinct 2-jointed club, or the eyes are wanting, or the epinotum bispinose . . . . 63.

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[1] The parasitic *Leptothorax emersoni* Wheeler is very feebly dimorphic but it has the clavate hairs and sculptured integument of *Leptothorax*.

63. Worker caste monomorphic or but slightly dimorphic; or else the head of the worker major is subquadrate or broader than long and the club of the antennæ is 2-jointed . . . . .64.

Worker caste with very pronounced dimorphism. When the antennal club is 2-jointed, the head of the soldier is much longer than wide. . . . . .65.

64. Monomorphic. Antennal club 3-jointed. Eyes absent. Clypeus unarmed. (See p. 675).

Monomorium subgenus **Anillomyrma** Emery.

Antennal club 2-jointed, the last joint very long. Clypeus bicarinate, and usually with two apical teeth. Epinotum unarmed. Fore wings with one closed cubital and an open radial cell. Antennæ 11-jointed (exceptionally 10-jointed) in the female; 12-jointed in the male. (Cosmopolitan; often cleptobiotic).[1]

Solenopsis Westwood.

65. Antennal club 2-jointed. Soldier: head much longer than wide; mandibles with about 6 teeth. Fore wings with a closed radial and one closed cubital cell. Antennæ 11-jointed in the female, 13-jointed in the male. (Ethiopian, Malagasy, Sumatra).[2]

Aëromyrma Forel.

Antennal club 3- or 4-jointed. The other characters as in *Pheidole*. (Neotropical) . . . . **Decapheidole** Forel.

66. Antennæ 7- to 10-jointed, the last joint very large; no 2-jointed club. Thorax without spines or teeth. Eyes present. (Neotropical). . . . . **Allomerus** Mayr.

Antennæ 8- or 9-jointed, with 2-jointed club. Eyes often wanting. . . . . .67.

67. Monomorphic, without eyes or ocelli. Clypeus without carinæ. Antennæ 9-jointed, the last joint very long. Fore wings with one closed cubital and a closed radial cell. Female enormously larger than the worker, with 10-jointed antennæ. Male: antennæ 13-jointed. (Ethiopian, Indochinese, Neotropical).[3]

Carebara Westwood.

Clypeus bicarinate. Female considerably larger than the worker, though less so than in *Carebara* . . . . .68.

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[1] Forel (1918, Bull. Soc. Vaudoise Sc. Nat., LII, p. 155) has suggested a new subgeneric name *Synsolenopsis*, for *Solenopsis bruchi* Forel, on the supposition that this species is "probably parasitic" though it does not differ from the other *Solenopsis*. Although ethological peculiarities are valuable when taken with other characters in the definition of genera and subgenera, no value can be attached to mere surmises as to peculiar habits which are not accompanied by morphological differences.

[2] In *Oligomyrmex debilis* Santschi the worker has 9-jointed and the soldier 10-jointed antennæ; the female is unknown.

[3] The Neotropical genus *Carebarella* Emery probably should come here; the worker is unknown. The female has 10-jointed, the male 13-jointed antennæ. Fore wings with one closed cubital and an open radial cell.

68. Monomorphic. Antennæ 9-jointed. Humeri of the pronotum rather angular. Wings unknown. Female with 10-jointed antennæ. Male unknown. (Ceylon, Ethiopian). **Pædalgus** Forel.

Strongly dimorphic; the soldier with small eyes; the worker blind. Antennæ 8- or 9-jointed. Fore wings with one closed cubital cell. Female with 9-jointed, male with 13-jointed antennæ. (Palearctic, Ethiopian, Malagasy, Indomalayan, Papuan, Australian).[1] .... **Oligomyrmex** Mayr.

a. Antennæ 9-jointed .... Subgenus **Oligomyrmex**, *sensu stricto*.

Antennæ 8-jointed. Eyes present, small. Female and male unknown. (Australian) .... Subgenus **Octella** Forel.

DOLICHODERINÆ Forel

Key to the Tribes

☿, ♀

1. Worker with well-developed sting. Petiole with a long peduncle in front. Clypeus large, with emarginate front margin. Mandibles triangular, toothed. Eyes present; ocelli absent. Claws simple. Spurs of tibiæ feebly denticulate. Female: clypeus feebly emarginate; ocelli developed; wings unknown. Male unknown .... ANEURETINI Emery.

Sting of worker and female vestigial (less so in *Froggattella*). Petiole squamiform or nodiform, not pedunculate in front .. 2.

2. Chitinous integument stiff and more or less brittle, often strongly sculptured. Mandibles triangular, toothed. Gizzard without a calyx and with delicate cuticle, not furnished with cilia at the entrance. Fore wings of female and male with two closed cubital cells and one discoidal cell ... DOLICHODERINI Emery.

Chitinous integument thin and flexible, finely and feebly sculptured .... 3.

3. Worker: gizzard without calyx, furnished with cilia at the entrance. Body very slender. Legs and antennæ much elongated. Antennal fossæ distinctly separated from the clypeal fossa. Mandibles triangular, toothed. Female probably highly ergatoid. Male with very peculiar venation of the fore wing: pterostigma vestigial; radial cell very narrow and long; no closed cubital nor discoidal cell LEPTOMYRMICINI Emery.

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[1] This genus contains the smallest ant known, *Oligomyrmex bruni* Forel, of Ceylon, the worker of which measures 0.8 to 0.9 mm. and the soldier 1.5 mm. in total length.

Worker and female: gizzard with a reflected calyx. Body less slender, the legs not so elongated. Antennal fossa more or less fused with the clypeal fossa............TAPINOMINI Emery.

1. **Aneuretini** Emery

Aneuretus Emery. (Ceylon).

2. **Dolichoderini** Emery

Dolichoderus Lund. (Palearctic, Nearctic, Indomalayan, Papuan, Australian, Neotropical except Chile).

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a. Mesonotum longer than broad. (Neotropical).
Subgenus **Dolichoderus,** *sensu stricto.*
Mesonotum at most as long as broad............................*b*.
b. Scale of the petiole ending above in an angle or a single spine. Pronotum almost always with two spines or angles. (Neotropical).
Subgenus **Monacis** Roger.
Scale of the petiole never ending in an angle or a single spine. Pronotum seldom bispinose. (Same distribution as the genus).
Subgenus **Hypoclinea** Mayr.

The genus *Linepithema* Mayr (Neotropical) is only known in the male; it comes very close to *Dolichoderus*, with which it may be congeneric.

3. **Leptomyrmicini** Emery

Leptomyrmex Mayr. (Australian, Papuan).

4. **Tapinomini** Emery

☿ (♀ as far as known)

1. Worker and female: antennæ 11-jointed. Clypeus entire. Cloacal orifice inferior. Gizzard as in *Technomyrmex*, the calyx without cilia, areolate. Female: fore wings with one cubital cell. (South Africa[1])..........................**Semonius** Forel.
Worker and female: antennæ 12-jointed.......................2.
2. Gizzard much longer than broad, the calyx entirely covered with long hairs. Cloacal orifice inferior. Worker monomorphic; thorax not impressed at the mesoëpinotal suture; ocelli present. Female: fore wing with a closed radial, two closed cubital cells and one discoidal cell. (Mediterranean, Burma, Assam, China, Nearctic, northern Mexico).
Liometopum Mayr.

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[1] Viehmeyer has recently (1916) described a *Semonius* from Singapore.

Gizzard shorter, with different structure. Ocelli often absent in the worker; when present, the thorax is impressed at the meso-ëpinotal suture.................................3.

3. Epinotum with two teeth or spines in the worker; female unknown..4.

Epinotum not bidentate nor bispinose. Eyes never very large..5.

4. Petiole with a feebly inclined scale. Eyes placed before the middle; usually very large, occupying one third of the side of the head. Cloacal orifice apical. (Australian, Papuan)..**Turneria** Forel.

Petiole with a strongly oblique scale, which is produced behind into a kind of peduncle. Eyes much smaller. (Australian). **Froggattella** Forel.

5. Maxillary palpi very long, 6-jointed; the third joint much longer than the second or the following ones. Epinotum of the worker with a small tubercle or produced into a blunt cone or a single spine. Scale of petiole well developed. Cloacal orifice inferior..6.

Not presenting all these characters..........................7.

6. Epinotum of the worker with a small tubercle. Female: fore wing with a discoidal and two closed cubital cells. (Argentina). **Araucomyrmex** Gallardo.

Epinotum of the worker produced into a blunt cone or a single spine. Female: fore wing with a narrow, open radial cell, one or two closed cubital cells, and no discoidal cell. (Neotropical, Nearctic)....................**Dorymyrmex** Mayr.

a\. Petiole nodiform.

Subgenus **Dorymyrmex**, *sensu stricto* (=*Psammomyrma* Forel).

Petiole not nodiform.................Subgenus **Conomyrma** Forel.

7. Scale of the petiole more or less inclined, sometimes very low but still distinct. Cloacal orifice inferior.....................8.

Scale of the petiole rudimental or none.........................11.

8. Gizzard very short, with a broad, reflected calyx which surrounds all other parts. Worker: monomorphic, though of variable size; no ocelli; thorax more or less impressed in front of the epinotum. (Including *Doleromyrma* Forel). (Neotropical, Indomalayan, Papuan, Australian).........**Iridomyrmex** Mayr.

Gizzard differently shaped......................................9.

9. Maxillary palpi 2- or 4-jointed; labial palpi 2- or 3-jointed. Worker monomorphic; thorax not impressed in front of the epinotum. Female: fore wing with one closed cubital and a discoidal cell. (Nearctic, Mediterranean, Indomalayan, Papuan, Australian). **Bothriomyrmex** Emery.

a. Maxillary palpi 4-jointed. (Mediterranean, Nearctic). Subgenus **Bothriomyrmex**, *sensu stricto*.

Maxillary palpi 2-jointed. (Indomalayan, Papuan, Australian). Subgenus **Chronoxenus** Santschi.

Maxillary palpi 6-jointed; labial palpi 4-jointed. Thorax impressed at the mesoëpinotal suture .... 10.

10. Scale of the petiole strongly inclined, at least in the worker; small but distinct in the worker, well developed in the female. Gaster produced in front over the petiole. Gizzard with a convex, 4-lobed calyx. Female: fore wing with a narrow, open radial, two closed cubital, and no discoidal cells. (Neotropical to Texas) .... **Forelius** Emery.

Scale of the petiole more or less inclined. Gaster not produced over the petiole. Worker often remarkably dimorphic, usually with ocelli. Gizzard short, without distinct lobes. Female: fore wing with a closed radial, one closed cubital, and a closed discoidal cell. (Neotropical; absent in Chile) . . **Azteca** Forel.

11. Maxillary palpi 4-jointed; labial palpi 3-jointed. Gizzard with narrow lobes, remote from each other, forming margins along the slits. Cloacal orifice inferior. Worker monomorphic. Female: fore wing with a closed radial, one closed cubital, and a closed discoidal cell. (Ethiopian). . . **Engramma** Forel.

Maxillary palpi 6-jointed; labial palpi 4-jointed. Gizzard with a depressed calyx; as a rule without lobes .... 12.

12. Calyx of the gizzard as a rule continuous, covered with fine cilia. Fifth segment of the gaster usually not reaching beyond the fourth; the cloacal orifice inferior. Female: fore wings with one closed cubital cell; with or without discoidal cell. (Cosmopolitan, except New Zealand) .... **Tapinoma** Förster.

The subgenus *Ecphorella* Forel (Ethiopian) is known only from one worker and its gizzard has not been dissected; it differs from the typical *Tapinoma* in its short, thick antennæ and its distinct, though low scale; the clypeus is entire.

Calyx of the gizzard not covered with cilia, but with a peculiar, areolate structure. Fifth segment of the gaster always reaching beyond the fourth; the cloacal orifice apical. Female: fore wings with two closed cubital cells and one discoidal cell. (Ethiopian, Malagasy, Indomalayan, Papuan, Australian, southern Japan) .... **Technomyrmex** Mayr.

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The male of *Turneria* Forel, *Froggattella* Forel, and *Ecphorella* Forel is unknown.

1. Radial cell narrow and open; no discoidal cell................2.
   Radial cell broad and closed...................................3.
2. Third joint of the maxillary palpi much longer than the second, about as long as the following together....**Dorymyrmex** Mayr.
   Third joint of the maxillary palpi about as long as the second, much shorter than the following together....**Forelius** Emery.
3. Fore wings with two closed cubital cells.......................4.
   Fore wings with one closed cubital cell........................6.
4. Scape about as long as the three first joints of the funiculus. Genitalia very large, taking about one third of the gaster. **Liometopum** Mayr.
   Scape much shorter than the three first joints of the funiculus..5.
5. Mandibles long, with numerous small teeth, crossing each other broadly............................**Technomyrmex** Mayr.
   Mandibles short, at most with a few teeth. **Iridomyrmex** Mayr (part).
6. Scape at most as long as the second joint of the funiculus. Mandibles as a rule narrow and with few teeth...........7.
   Scape at least as long as the two or three first joints of the funiculus together.......................................8.
7. Antennæ filiform ....**Iridomyrmex** Mayr.
   Antennæ moniliform.............................**Azteca** Forel.
8. Scape half as long as the funiculus. Mandibles elongate, with numerous small teeth.....................**Semonius** Forel.
   Scape usually as long as the three or four first joints of the funiculus. Maxillary palpi 6-jointed................**Tapinoma** Förster.
   Scape shorter, as long as the two first joints of the funiculus. Maxillary palpi 4-jointed.........................**Engramma** Forel.

FORMICINÆ Lepeletier

Key to the Tribes

☿, ♀

1. Worker: head much broader than the thorax; eyes very large, occupying nearly the whole side of the head; no frontal carinæ; mandibles very long, linear and slender, parallel, bent at right angles and dentate at apex, denticulate along their inner margin; antennæ 12-jointed, filiform, inserted some distance

behind the clypeus; gizzard with very short calyx; the four sepals strongly diverging and heavily chitinized from their base on, short and recurved. Female: similar: fore wings with a small closed discoidal, one closed cubital, and a closed radial cell. Male: head broader than the thorax, with very large eyes; mandibles small, vestigial; antennæ 13-jointed; wings as in the female . . . . MYRMOTERATINI Forel.

Mandibles subtriangular, of a different conformation. The eyes usually medium-sized. . . . . .2.

2. Antennæ 12-jointed in worker and female; 13-jointed in the male . 3.

Antennæ 8- to 11-jointed . . . . .9.

3. Worker: eyes very large, occupying nearly the whole of the sides of the head; frontal carinæ almost absent; clypeus prolonged between the antennæ; temples strongly toothed behind; epinotum bispinose; node of the petiole thick, bidentate behind. Male and female unknown . . .SANTSCHIELLINI Forel.

Worker: eyes usually of medium size; in *Gigantiops* very large, but in this the temples and epinotum are unarmed and the other characters given above do not agree . . . . .4.

4. Eyes very large, occupying nearly the whole of the sides of the head. Gizzard long and narrow, with a rather straight calyx. Antennæ inserted some distance behind the frontal area, but near the extremities of the frontal carinæ. Maxillary palpi 6-jointed; labial palpi 4-jointed. Clypeus much produced and truncate in front . . . . .GIGANTIOPINI Ashmead.

Eyes occupying less than one-half of the sides of the head . . . . . .5.

5. Gizzard very short, with the sepals extremely short or with the calyx reflected and surrounded by a muscular ring. Ocelli present. Front wings with or without a closed discoidal cell. Cocoons present. (Australian, New Zealand, Chilean).

MELOPHORINI Forel.

Gizzard with the calyx straight or feebly curved, little or not at all reflected, with distinct sepals . . . . .6.

6. Clypeal fovea distinctly separated from the antennal fovea. Antennæ filiform, inserted very near the posterior edge of the clypeus and close to the frontal area. Gizzard with the calyx more or less curved or reflected. Ocelli absent. No cocoons.

PRENOLEPIDINI Forel.

Clypeal fovea confluent with the antennal fovea, or else the antennæ are inserted some distance behind the clypeus. Gizzard with rather straight calyx (except in *Overbeckia*) . . . . . .7.

7. Antennæ inserted very near the posterior edge of the clypeus and close to the frontal area. Antennæ filiform. Ocelli present, vestigial, or absent .... FORMICINI Forel.

Antennæ inserted some distance behind the clypeus .... 8.

8. Antennæ inserted a short distance behind the frontal area but near the extremities of the frontal carinæ; funiculus slender at the base, slightly incrassate at the apex. Ocelli absent. Clypeal fovea more or less distinct from the antennal fovea. Maxillary palpi 5-jointed. Mandibles long and broad, with acute, curved apex, denticulate along the masticatory margin. Petiole elongate, narrow, nodose, unarmed. Stature variable, but not dimorphic in the form of the head. Fore wings with one closed cubital, a closed radial, and no discoidal cell. Male without distinct tarsal claws. Arboreal, silk-weaving ants. No cocoons. ŒCOPHYLLINI Forel.

Antennæ inserted on the sides of the frontal carinæ, very far from the clypeus and the frontal area; funiculus as a rule filiform. Clypeal and antennal foveæ distinctly separated. Maxillary palpi 6-jointed. Petiole short, squamiform or nodiform, often spinose or dentate. Ocelli absent. Cocoons present. CAMPONOTINI Forel.

9. Antennæ 8-jointed. Eyes lateral, very large, more or less reniform. Clypeus produced behind between the frontal carinæ ...... 10.

Antennæ 8- to 11-jointed. Eyes oval, of medium size. Fore wings without discoidal cell .... 11.

10. Strongly dimorphic. Clypeus not projecting forward above the mandibles. Female: antennæ 10-jointed; fore wings with a closed discoidal, one closed cubital, and a clo sedradial cell. Male unknown .... DIMORPHOMYRMICINI Wheeler.

Feebly dimorphic. Clypeus projecting forward above the mandibles. Female unknown. Male doubtful .. GESOMYRMICINI Forel.

11. Antennæ 11-jointed (except in some *Rhizomyrmæ*). Gizzard rather long, with reflected sepals. Male with 12-jointed antennæ. Fore wings with one closed cubital, a closed radial, and no discoidal cell. Cocoons present .... PLAGIOLEPIDINI Forel.

Antennæ 8- to 10-jointed. Gizzard short. Male with 11- or 10-jointed antennæ. Venation as in the Plagiolepidini. MYRMELACHISTINI Forel.

1. **Myrmoteratini** Forel

Myrmoteras Forel. (Burma, Philippines, Borneo).

2. **Dimorphomyrmicini** Wheeler

Dimorphomyrmex Ern. André. (Philippines, Borneo).

3. **Santschiellini** Forel

Santschiella Forel. (Ethiopian).

4. **Melophorini** Forel

☿, ♀

1. Prothorax with an angular crest on either side. Metanotum prominent in the form of a boss or spine which is sometimes forked. Petiole more or less bidentate. Antennal and clypeal foveæ non-confluent. No psammophore. Monomorphic. (Australian).................................**Notoncus** Emery.

Prothorax not crested on the sides. Metanotum not boss- or spine-shaped...2.

2. Funiculus of the antennæ distinctly swollen into a 4- or 5-jointed club. Antennæ placed very close to the hind border of the clypeus and at the anterior extremities of the frontal carinæ. Clypeal and antennal foveæ confluent. No ocelli. No psammophore. Mandibles very convex, with numerous teeth along their apical border. Thorax, epinotum and petiole unarmed. Polymorphic, without repletes acting as honey-pots. Female and male unknown. (Australian).

Myrmecorhynchus Ern. André.

Funiculus of the antennæ not forming a distinct club; when feebly club-shaped the other characters do not all agree.........3.

3. Scale of the petiole with two distinct spines above. No psammophore. Clypeal and antennal foveæ not confluent. Monomorphic, large and slender. Fore wings without discoidal cell. (Australian)....**Diodontolepis** Wheeler. (Type: *Melophorus spinisquamis* Ern. André).

Scale of the petiole not bispinose, at most feebly emarginate above...4.

4. Polymorphic, often with replete workers acting as honey-pots. Psammophore and clypeal bristles more or less developed. Clypeal and antennal foveæ separated. Fore wings without discoidal cell. (Australian)..........**Melophorus** Lubbock.

Monomorphic, without repletes. Clypeal and antennal foveæ confluent..5.

5. Fore wings without discoidal cell. (New Zealand). . **Prolasius** Forel.

Fore wings with a closed discoidal cell. (Chile).**Lasiophanes** Emery.

5. **Plagiolepidini** Forel

☿ (♀ as far as known)

1. Maxillary palpi 2-jointed; labial palpi 3-jointed. Worker small, hypogæic, pale-colored, with minute eyes; ocelli absent. . . .2.

Maxillary palpi 6-jointed; labial palpi 4-jointed. Antennæ always 11-jointed. Fore wings without discoidal cell. . . . . .4.

2. Apical margin of the mandibles with a heavy, blunt, basal tooth, remote from the four other apical teeth and somewhat curved forward; the mandibles continue directly the inferior edges of the head. Head rectangular. Antennæ 11-jointed. (Indomalayan)..............................**Atopodon** Forel.

Mandibles not continuing the inferior edges of the head, but somewhat more toward the middle line; without basal, blunt tooth at the apical margin......................................3.

3. Antennæ 11-jointed, with filiform funiculus. Mandibles narrowly triangular; the apical margin oblique, 5-toothed. (Ethiopian, India, Ceylon, Burma, Papuan, Australian). .**Acropyga** Roger.

Antennæ 8- to 11-jointed. Mandibles narrow, rather long, almost straight; the apical margin very oblique, with 3 or 4 narrow and sharp teeth, passing gradually into the inner margin. (Neotropical, Indomalayan, Papuan). . . .**Rhizomyrma** Forel.

4. Female: head oblong; eyes large, placed in front of the middle and at the sides of the head; ocelli present; mandibles broad, convex, with 6 teeth; clypeus short and convex, not extending back between the frontal carinæ; frontal area obsolete; frontal carinæ straight, very short, as far or farther apart than their distance from the side of the head; antennæ 11-jointed,[1] the funiculus short, gradually thickened, without club; thorax small and narrow, not broader than the head; epinotum and scale of the petiole unarmed; fore wings without discoidal cell; of small size (under 3 mm.). Worker and male unknown. (Philippines) . . . . .**Pseudaphomomyrmex** Wheeler. (Type: *Aphomyrmex emeryi* Ashmead).

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[1] Ashmead describes the antennæ of *Aphomyrmex emeryi* as "apparently 10-jointed"; they are distinctly 11-jointed in the specimen before me.

Not answering the above description. Female usually over 3 mm. in length. . . . . 5.

5. Worker: small; clypeus carinate; thorax slender, often saddle-shaped at the mesonotum; epinotum excavated, its lateral angles spinose; scale of the petiole more or less bispinose or bidentate; ocelli distinct. Female large in proportion to the worker (over 4 mm.), with bifid petiolar scale. Male as in *Plagiolepis*. . . . . 6.

Worker: small or medium-sized; clypeus convex or carinate; thorax rather short, not or feebly saddle-shaped at the mesonotum, epinotum rounded, unarmed; scale of the petiole inclined in front, not emarginate above, either acute, or flat, or rounded above; ocelli absent. Female much larger than the worker (rarely less than 3 mm.), with entire scale of the petiole. (Palearctic, Ethiopian, Malagasy, Indomalayan, Papuan, Australian) . . . . **Plagiolepis** Mayr.

a. Metanotum very prominent and distinctly separated from a short and convex epinotum. Small species . Subgenus **Anacantholepis** Santschi.

Metanotum not very prominent. . . . . *b.*

b. Mesonotum not constricted nor impressed in front of the stigmata which are low. Epinotum more or less raised. As a rule medium-sized species . . . . Subgenus **Anoplolepis** Santschi.

Mesonotum constricted or impressed in front of the stigmata which are raised. Small species . . . . Subgenus **Plagiolepis**, *sensu stricto.*

6. Worker and female: epinotum quadridentate; scale of the petiole not oblique, the gaster without anterior impression to receive the scale. (Australian) . **Stigmacros** Forel (= *Acrostigma* Forel).

Worker and female: epinotum bidentate; scale of the petiole oblique; the gaster with an anterior impression. (Mediterranean, Central Asia, Ethiopian, Malagasy, Indomalayan). **Acantholepis** Mayr.

6. **Myrmelachistini** Forel

☿, ♀

1. Last joints of the antennæ forming a differentiated club. Antennæ 9- or 10-jointed. Small, arboreal ants. (Neotropical). **Myrmelachista** Roger.

a. Antennæ 9-jointed . . . . Subgenus **Myrmelachista**, *sensu stricto.*

Antennæ 10-jointed . . . . Subgenus **Decamera** Roger

Antennæ without differentiated club 2

2. Worker: polymorphic; antennæ 8-jointed; frontal carinæ closer together than in *Aphomomyrmex*; mandibles with 4-toothed apical margin and a bluntish tooth near the external base; eyes lateral. Female: antennæ 8-jointed; 6 to 7 mm. long. Male unknown. (Borneo)...**Cladomyrma** Wheeler. (Type: *Aphomomyrmex hewitti* Wheeler. Includes also *Dimorphomyrmex andrei* Emery, only known from the female, with 8-jointed antennæ).

   Antennæ of worker and female 9- or 10-jointed. Mandibles without blunt tooth externally..............................3.

3. Worker: polymorphic; antennæ 9-jointed; frontal carinæ feeble, remote from each other; eyes placed at the upper side of the head. Female and male with 10-jointed antennæ. Arboreal, medium-sized. (Ethiopian)........**Aphomomyrmex** Emery.

   Worker: monomorphic; antennæ 9-jointed; frontal carinæ more approximated; thorax short and thick-set. Female: antennæ 9-jointed. Hypogæic, minute. (Nearctic. Neotropical: one species has been introduced into the Malagasy Region).
   Brachymyrmex Mayr.

7. **Gesomyrmicini** Forel

Gesomyrmex Mayr. (Borneo, China; fossil in Baltic amber).

8. **Prenolepidini** Forel

Prenolepis Forel. (Cosmopolitan).

a. Worker: thorax strongly constricted and subcylindric at the mesothorax, swollen in front and behind the constricted portion; scape and tibiæ without erect setæ, with a long, obliquely raised pilosity. Female and male with the same pilosity of the tibiæ. Male with well-developed cerci Subgenus **Prenolepis**, *sensu stricto*.

   Worker: thorax not strikingly constricted at the mesothorax and not swollen in front and behind..............................*b*.

b. Female, male and worker: scape and tibiæ with a short pilosity which is adherent or hardly raised; also as a rule with strong, erect setæ, which are simple or thick and obtuse. Male without cerci.
   Subgenus **Nylanderia** Emery.

   Worker: scape and tibiæ with long, erect, stiff, pointed setæ, without adherent pilosity. Male and female unknown.
   Subgenus **Euprenolepis** Emery.

9. **Formicini** Forel

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1. Joints 2 to 5 of the funiculus shorter or not longer than the succeeding joints. Ocelli usually absent........................2.

   Joints 2 to 5 of the funiculus longer than the succeeding joints. Ocelli distinct......................................3.

2. Mandibles long, with oblique, dentate blades. Eyes small or vestigial. Dimorphism very marked; head large in the worker major, with convex sides and more or less excised behind. Clypeal fovea slightly separated from the antennal fovea. Hypogæic. Fore wing without discoidal cell. (Ethiopian, Indomalayan, Papuan, Australian)...**Pseudolasius** Emery.

   Mandibles shorter, with less oblique blades. Dimorphism scarcely or not at all perceptible. Fore wing normally with closed discoidal cell. (Holarctic).

   Lasius Fabricius. (=*Donisthorpea* Morice and Durrant).

   a. Large, black, shining, arboreal species, very feebly or not pubescent. Eyes well developed. Ocelli small, but distinct. Temporary social parasite of *L. umbratus* which is itself a temporary parasite of *L. niger*. (Palearctic)..................Subgenus **Dendrolasius** Ruzsky.

   Integument not black and shining, with more or less distinct pilosity. Ocelli usually absent or indistinct. Epigæic or hypogæic........*b*.

   b. Maxillary palpi 4-jointed. Eyes vestigial. Small, hypogæic, yellow. (Nearctic)....................Subgenus **Acanthomyops** Roger.

   Maxillary palpi 6-jointed.....................................*c*.

   c. Terminal joints of the maxillary palpi long, subequal. Eyes medium-sized. Epigæic, dark-colored. (Holarctic)..Subgenus **Lasius**, *sensu stricto*.

   Terminal joints of the maxillary palpi gradually diminishing towards the apex. Eyes minute. Hypogæic, pale-colored. (Holarctic).

   Subgenus **Chthonolasius** Ruzsky.[1]

3. Fourth joint of the maxillary palpi nearly twice as long as the fifth. Fore wings with discoidal cell present in the female, absent in the male..4.

   Fourth joint of the maxillary palpi a little longer than the fifth (much longer in *Paraformica*)........................5.

4. Male much smaller than the female, not larger than the largest worker. Psammophore of the usual form, at the posterior

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[1] Donisthorpe has pointed out that, as I had previously designated *Formica rufa* as the type of *Formicina* Shuckard, and as therefore this name becomes a synonym of *Formica* Linnaeus, it is necessary to use Ruzsky's *Chthonolasius* for this subgenus. It may also be noted that the name *Formicina* has been used by Canestrini for a genus of ant-like spiders in 1868.

surface of the gula. Some workers functioning as repletes (honey ants). (Sonoran parts of the Nearctic Region).

Myrmecocystus Wesmael.

Male slightly smaller than the female. Psammophore at the anterior surface of the gula. No repletes; highly predatory. (Mediterranean, Central Asia, Ethiopian).

Cataglyphis Fœrster.

a. A specialized soldier form with huge, sabre-shaped mandibles. Basal joints of maxillary palpi with a fringe of long, recurved setæ. Body covered with silvery pubescence. . .Subgenus **Machæromyrma** Forel.

No specialized soldier form with huge mandibles. Pubescence not silvery.

Subgenus **Cataglyphis**, *sensu stricto*.

5. Mandibles narrow and pointed, falcate, toothless but minutely serrulate. Petiole very thick, rounded above. Maxillary palpi 4-jointed; labial palpi 2-jointed. Frontal carinæ short, straight, parallel. Male much smaller than the female, with the scape much shorter than in *Formica*. Female usually winged, rarely ergatoid. Slave-making (dulotic), permanent social parasite of *Formicæ* of the *fusca* group and the species of *Neoformica*. (Holarctic). . . . . **Polyergus** Latreille.

Mandibles subtriangular, with the apical margin broad and denticulate. Maxillary palpi 6-jointed; labial palpi 4-jointed. Male somewhat smaller than the female. (Holarctic).[1]

Formica Linnæus.

a. Median joints of the maxillary palpi elongate, somewhat as in *Cataglyphis*. Mesoëpinotal constriction pronounced, saddle-shaped. (North Africa). . . . . .Subgenus **Paraformica** Forel.

Fourth joint of the maxillary palpi only a little longer than the fifth. Mesoëpinotal constriction less pronounced. . . . . *b*.

b. First funicular joint about as long as the second and third joints taken together, the latter shorter or at least not longer than the penultimate joints. Frontal carinæ short, subparallel, not diverging behind. Stipes of the male genitalia much longer than the volsellæ and sagittæ. Small, mostly smooth, shining, dark-colored. (Mediterranean, Nearctic). . . . . .Subgenus **Proformica** Ruzsky.

First funicular joint distinctly shorter than the second and third joints taken together, the latter longer than the penultimate joints of the antennæ. Frontal carinæ longer and divergent. . . . . *c*.

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[1] The two subgenera *Raptiformica* Forel and *Serviformica* Forel are regarded as utterly untenable. *Raptiformica* is based on the presence of a notch in the anterior margin of the clypeus, but this is present in several North American species (*F. munda*, *F. manni*, etc.) which do not make slaves like the Holarctic *sanguinea*. Moreover, some of the forms allied to *F. subpolita* which should belong to *Serviformica* Forel, have a slight but distinct notch in the outer border of the clypeus.

c. Scape slender, scarcely curved at the base. Thorax longer. Stipes of male genitalia much longer than the volsellæ and sagittæ. (Nearctic). Subgenus **Neoformica** Wheeler.

Scape more or less curved. Thorax stouter. Stipes of male genitalia but slightly longer than the volsellæ and sagittæ. (Holarctic). Subgenus **Formica**, *sensu stricto.*

10. **Gigantiopini** Ashmead

Gigantiops Roger. (Neotropical).

11. **Œcophyllini** Forel

Œcophylla F. Smith. (Ethiopian, Indomalayan, Papuan, Australian).

12. **Camponotini** Forel

☿, ♀

1. Worker: eyes large and prominent, placed towards the posterior angles of the head; ocelli usually absent; clypeus well developed, carinate or subcarinate, its anterior border entire, broadly rounded and projecting over the base of the mandibles; thorax, epinotum and petiole unarmed; monomorphic or feebly dimorphic. Female similar but with ocelli and wings. Male as in *Camponotus.* Fore wings with a small, triangular discoidal cell sometimes wanting in the male. (Australian, Papuan) .... **Opisthopsis** Emery.

   Eyes on the sides of the head .... 2.

2. Thorax and petiole without spines or teeth .... 3.

   Thorax and petiole, or the latter alone, more or less spinose or dentate .... 6.

3. No marked dimorphism in the worker .... 4.

   Dimorphism more or less clearly marked in the size, form, and often in the sculpture of the head. Stature usually very variable .. 7.

4. Funiculus slender at the base, slightly thickened towards the apex. Gizzard as in the Prenolepidini, with a short, more or less recurved calyx. (Singapore) .... **Overbeckia** Viehmeyer.

   Funiculus filiform. Gizzard with rather straight calyx .... 5.

5. Body thick-set. Head rounded behind. (Indomalayan, Papuan, Australian) .... **Calomyrmex** Emery.

   Body slender. Head narrowed behind. (Neotropical). **Dendromyrmex** Emery.

Large. Head rectangular, with rounded posterior angles. Clypeus flat, without carina or lobe, broadly notched in the middle of its anterior margin. Dorsum of the thorax flat, obtusely margined, with three sutures; pronotum with projecting humeral angles; epinotum truncate behind. Scale of the petiole very thick, angulate on the sides of its dorsal face. (Ethiopian).
Phasmomyrmex Stitz.

6. Body thick-set. Thorax without spines, its anterior angles rounded. Petiole prolonged into a point on either side. (Indomalayan, Australian, Papuan).[1] . . . . **Echinopla** F. Smith.

Body less thick-set. Thorax usually dentate or spinose; when this is not the case the body is shining jet black and the scale of the petiole is quadridentate. (Ethiopian, Syria, Indomalayan, Papuan, Australian) . . . . **Polyrhachis** F. Smith.

a. Eyes truncate or incised posteriorly, supported laterally by a lobe of the head in the form of a blinder. Meso- and epinotum separated by a deep transverse furrow. Thorax unarmed. (Indomalayan).
Subgenus **Hemioptica** Roger. (Type: *Hemioptica scissa* Roger).

Eyes entire, round or oval; usually free, rarely with a distinct blinder . . *b*.

b. Dorsal face of the thorax convex, more or less rounded at the sides which are not margined along their whole length . . . . *c*.

Dorsal face of the thorax with a continuous carina extending full length of the sides of pro- and mesonotum, and continuing on the epinotum . . *f*.

c. Spines of the petiole united at the base, long, diverging and hook-shaped at the apex. Pro- and mesonotum with a pair of spines, which are often hooked. (Indomalayan).
Subgenus **Polyrhachis**, *sensu stricto*. (Type: *Formica bihamata* Drury).

Spines of the petiole not ending in recurved hooks . . . . *d*.

d. Thorax very convex, shining, either wholly unarmed, or with small teeth at the epinotum. Petiole armed above with subequal, acute teeth. Arboreal; spinning vegetable débris together with silk. (Ethiopian, Indomalayan, Papuan, Australian).
Subgenus **Cyrtomyrma** Forel. (Type: *Formica rastellata* Latreille).

Thorax with spines on pro- or epinotum, or on both. Petiole also with a pair of long spines . . . . *e*.

e. Spines of the epinotum longer than those of the pronotum; the latter sometimes lacking. Mesonotum unarmed. Petiole with two long spines more or less diverging and embracing the base of the abdomen. Arboreal and often silk-spinning. (Syria, Indomalayan, Papuan, Australian).
Subgenus **Myrmhopla** Forel. (Type: *Formica armata* Le Guillou).

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[1] The genus *Mesoxena* F. Smith, of New Guinea, has not been seen since Frederick Smith's time; according to Emery, it is related to *Echinopla*.

Pronotum unarmed or with feeble crests or spines. Mesonotum with a pair of raised lateral crests or tubercles. Petiole with two erect, long spines. (Papuan, Indonesian).

Subgenus **Myrmatopa** Forel. (Type: *Polyrhachis schang* Forel).

f. Petiole armed with 3 spines, the median one as long as, or longer than, the lateral ones. Pronotum with a short spine or tooth; mesonotum almost unarmed. Silk-spinning and arboreal.

Subgenus **Myrmothrinax** Forel. (Type: *Polyrhachis thrinax* Roger).

Petiole not three-spinose. Pro- or mesonotum, or both armed with spines. *g.*

g. Petiole high, flattened above, with two horizontal diverging spines which surround the base of the gaster. Pronotum convex, with strong humeral spines; epinotum also strongly bispinose. Arboreal. (Australian).

Subgenus **Hedomyrma** Forel. (Type: *Polyrhachis ornata* Mayr).

Petiole differently shaped, not flattened above........................*h.*

h. Pronotal angles more or less rounded, not spinose. Thorax narrow and elongate, rather flattened above. Epinotum with two long, horizontal spines. Petiole with two horizontally diverging spines which embrace the base of the gaster. Terrestrial, nesting in the ground or in old logs. (Australian).

Subgenus **Hagiomyrma** Wheeler. (Type: *Formica ammon* Fabricius).

Pronotal angles sharp, toothed or spinose. Epinotum either unarmed, or with short teeth, or with two long spines......................*i.*

i. Pronotum angular or shortly toothed. Epinotum unarmed or with small teeth. Thorax feebly convex or flattened. Petiole usually with short, tooth-like spines. Terrestrial, nesting in the ground. (Indomalayan, Papuan, Australian).

Subgenus **Campomyrma** Wheeler. (Type: *Polyrhachis clypeata* Mayr).

Pronotum with spines or long teeth..................................*j.*

j. Epinotal spines usually very short and directed upward. Thorax rather short and convex above. Petiole with long, diverging spines. (Ethiopian, Indomalayan, Papuan).

Subgenus **Myrma** Billberg. (Type: *Formica militaris* Fabricius).

Epinotal spines long and horizontal or oblique ....*k.*

k. Body broad and flattened. Petiole with a pair of long, horizontally diverging spines which embrace the base of the gaster. Small, terrestrial, nesting in the ground. (Indomalayan, Papuan, Australian).

Subgenus **Chariomyrma** Forel. (Type: *Polyrhachis guerini* Roger).

Body long and slender. Petiole with a pair of suberect, oblique spines. (Indomalayan, Papuan).

Subgenus **Dolichorhachis** Mann. (Type: *P.* (*Dolichorhachis*) *malaënsis* Mann).

7. Worker: Head more or less elongate, rounded and narrowed behind in the worker minor, broadened behind in the worker major; eyes placed much behind the middle, ocelli distinct in the worker major; mandibles projecting, multidentate; clypeus carinate, with a rounded lobe, somewhat emarginate in

the middle; frontal carinæ close together, almost straight, very slightly diverging behind; antennal scape very long, extending beyond the occipital margin for over half its length, even in the worker maxima; thorax elongate, with saddle-shaped dorsum; its lowest and narrowest portion consisting of the metanotum, which is broadly exposed, limited by sutures in front and behind, with its spiracles close together on the dorsum; epinotum rounded tuberculate; scale of the petiole thick and obtuse. Female: winged; head and antennæ as in the worker major; scale of the petiole higher and slightly emarginate at the top. Male: body slender; head elongate; eyes larger, placed much behind the middle of the sides; mandibles with the masticating border broad and multidentate; clypeus with anterior margin rounded and emarginate in the middle; thorax comparatively low and long; scale of the petiole nodiform; genitalia much larger and stronger than in *Camponotus*, the stipes triangular. (Australian).

Notostigma Emery.

Not agreeing in all these characters. (Cosmopolitan).

Camponotus Mayr.

Emery in 1896[1] divided the numerous species of *Camponotus* into more or less natural groups (twenty-six *manipuli*, arranged into three *cohortes*). Building further in this direction, Forel in 1912[2] proposed to subdivide the genus into twenty subgenera; later[3] he published a list of all the species known at that time, adding several new subgeneric divisiens. Quite recently Emery[4] has published a revised classification of the genus, taking also into account the geographic distribution of the species. The characters of the various subgenera given below are merely translated from Forel's and Emery's papers. Since both these authors recognize many transitions between the several groups, it has not seemed worth while to tabulate them in the regular key form.

In his paper of 1912 Forel failed to designate any subgenotypes, although he cited a number of species under each of his subgenera. The following year I undertook to supply this omission.[5] Later, in his more extensive account of the subgenera of *Camponotus*, Forel cited a type for each of them, but apparently without consulting my previous designations. It happened, however, that in all but eight cases we selected the same species. In his recent paper, Emery evidently also overlooked my designations of the types of Forel's subgenera, thus bringing about a certain amount of confusion, to overcome which I have been obliged to propose a number of new subgeneric names.[1]

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[1] Emery, C. 1896. 'Saggio di un catalogo sistematico dei generi *Camponotus*, *Polyrhachis* e affini.' Mem. Accad. Sc. Bologna, (5) V, pp. 761–780.

[2] Forel, A. 1912. 'Formicides néotropiques. Part VI. 5me sous-famille Camponotinæ Forel.' Mém. Soc. Ent. Belgique, XX, pp. 59–92.

[3] Forel, A. 1914. 'Le genre *Camponotus* Mayr et les genres voisins.' Rev. Suisse Zool., XXII, pp. 257–276.

[4] Emery, C. 1920. '*Le genre "Camponotus"* Mayr. Nouvel essai de sa subdivision en sous-genres.' Rev. Zool. Afr., VIII, 2, pp. 229–260.

[5] 1913. 'Corrections and additions to the "List of type species of the genera and subgenera of Formicidæ".' Ann. New York Ac. Sci., XXIII, pp. 77–83.

Subgenus **Camponotus**, *sensu stricto*

Large species. Clypeus without carina or the carina is little apparent, without anterior lobe or the anterior lobe feebly projecting, more or less rectangular (*japonicus*) or rounded (*sansabeanus*); its anterior margin not notched in the middle. Head of worker major and female not truncate or obtuse in front; but little broader behind than in front. Mandibles strongly arched, with 4 or 5, sometimes 6 teeth. Dorsum of the thorax convex, continuous in profile; dorsum of the pronotum rounded or sometimes depressed in the worker major, with slightly projecting humeri. *C. ocreatus* and *C. sansabeanus* connect this subgenus with the next. Nests as a rule in wood. (Holarctic, especially in North America; one species in Madagascar).

Type: *Formica herculeana* Linnæus subspecies *ligniperda* (Latreille).

Subgenus **Myrmoturba** Forel

Clypeus carinate, with a very pronounced lobe at its anterior margin, as a rule rectangular, rarely of another shape. Head of the worker major as a rule much broader behind than in front, often emarginate at its posterior border; that of the worker minor with parallel lateral margins or narrowed behind, so that the posterior border is much reduced. Mandibles as a rule with 6 or 7 teeth. Dorsum of the thorax arched as in the preceding subgenus; rarely the epinotum in profile is slightly depressed, saddle-shaped. Sculpture variable, in certain South American species (such as *C. chilensis*) the gaster is covered with an abundant fur of pubescence. Nests as a rule in the ground or underneath stones. Numerous transitions to other subgenera. (Cosmopolitan)................Type: *Formica maculata* Fabricius.

Subgenus **Dinomyrmex** Ashmead (= *Myrmogigas* Forel)

Large or very large species. Head of the worker minor narrowed behind into a neck, or at least without distinct posterior border, save for its articulation with the thorax. The remainder as in *Myrmoturba* to which this subgenus is closely connected. Nests in rotten wood. (Ethiopian, Malagasy, Indomalayan, Australian, Papuan, Neotropical)..................................Type: *Formica gigas* Latreille.

Subgenus **Myrmosericus** Forel

As in *Myrmoturba*, but the integument entirely opaque, very finely sculptured, silky and more or less covered with a rather abundant pilosity, especially on the gaster. Nests in earth or sand. (Mediterranean, Ethiopian, Oriental).

Type: *Formica rufoglauca* Jerdon.

Subgenus **Myrmothrix** Forel

As in *Myrmoturba*, but the head of the worker major is, as a rule, massive and rather rounded; that of the worker minor not narrowed behind. Large or medium-sized species, with abundant pilosity on the body and, with few exceptions, on the scapes and legs. The integument is almost always opaque and sometimes silky. Tarsi not compressed. One species in Brazil (*C. femoratus*) forms gardens in epiphytes; others build carton nests or nest in the ground or in rotten wood. (Neotropical).

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[1] Wheeler, Wm. M. 1921. 'Professor Emery's subgenera of the genus *Camponotus* Mayr.' Psyche, XXVIII, pp. 16–19. Santschi has recently proposed four additional subgenera of *Camponotus*: *Myrmisolepis*, *Myrmopelta*, *Myrmoplatypus*, and *Myrmepinotus* (1921. 'Retouches aux sous-genres de *Camponotus*.' Ann. Soc. Ent. Belgique, LXI, pp. 310-312). This paper came too late for the new subgenera to be included in the present account.

Type: *Formica abdominalis* Fabricius (Wheeler, 1913); *F. rufipes* Fabricius (Forel, 1914).

Subgenus **Myrmaphænus** Emery

Head of worker major longer than broad, with almost parallel lateral margins, rather depressed; its posterior margin emarginate. Clypeus, as a rule, without lobe, even sometimes with emarginate anterior border, with or without carina. Head of worker minor broadened behind. Integument opaque, finely sculptured, with coarse and short or longer and finer pilosity, in one species (*C. blandus*) silky. Thorax as in the preceding subgenera. Tibiæ and tarsi, as a rule, compressed. (Neotropical).

Type: *Camponotus leydigi* Forel.

Subgenus **Myrmepomis** Forel (=*Myrmolophus* Emery)

Worker with the humeral angles of the pronotum dentiform; median crest of mesonotum and epinotum and the tarsi much compressed. (One Neotropical species).

Type: *Formica sericeiventris* Guérin.

Subgenus **Myrmotarsus** Forel

Species analogous to *Myrmothrix* and *Myrmaphænus*. Head, as a rule, depressed in its anterior portion; mandibles projecting; clypeus, as a rule, without carina. Fore tarsi with a dense brush; tibiæ and tarsi compressed. Legs and scapes more or less villose. (Malayan).

Type: *Formica mistura* F. Smith (Wheeler, 1913); *F. irritabilis* F. Smith (Forel, 1914).

Subgenus **Myrmoplatys** Forel

Head still more depressed in front than in the preceding subgenus, which the species of the present group resemble. Legs not pilose; tibiæ and tarsi not compressed. In myrmecophilous plants. (Indomalayan). Type: *Camponotus korthalsiæ* Emery.

Subgenus **Myrmosaulus** Wheeler (=*Myrmosphincta* Emery, 1920; not of Forel, 1912)

Head of the worker major heart-shaped; that of the worker minor rounded and narrowed behind, in certain species, so as to have no posterior margin or even (*C. camelinus*) to form a neck as in certain species of *Dinomyrmex*. Thorax, as a rule, slender; pronotum rounded, not margined; a more or less pronounced depression on the dorsum in front of the epinotum which is more or less raised as a rounded protuberance (very distinctly in *C. cinerascens* and *C. camelinus*). Spiracles of the metanotum visible dorsally. Scale of the petiole more or less nodiform. Legs villose (except in *C. aurocinctus*). In *C. batesi* of Madagascar, the dorsum of the thorax is scarcely depressed in front of the epinotum; only the worker minor was known to Emery. (Indomalayan, Australian; one species of Madagascar doubtfully placed here) Type: *Formica cinerascens* Fabricius.

Subgenus **Myrmophyma** Forel (including *Myrmocamelus* Forel, in part)

Head in the small worker, as a rule, with parallel lateral margins; in most cases it is compressed laterally; the eyes are usually placed much behind the middle. In the worker maxima and female the head is broad, often with the vertex strongly swollen. Clypeus variable, without or with a lobe, which may be rounded or square, sometimes toothed or emarginate; often the lobe is distinct in the worker minor and disappears in the worker major. Mandibles strongly arcuate. The thorax is variable in profile: either uniformly arched, with the sloping face of the epinotum more or less abrupt; or the promesonotum protuberant, the epinotum is little arched or even feebly saddle-shaped (character of the subgenus *Myrmocamelus*); or the concavity of the epinotum is more pronounced (subgenus *Myrmosaga*). Pronotum sometimes more or less obtusely margined (*C. innexus*, *C. æneopilosus*, *C. inflatus*, etc.). Scale of the petiole more or less thickened; in *C. hoplites* armed with a spine. This subgenus passes into *Myrmoturba* through *C. testaceipes* and *C. claripes*, and into the next subgenus through the species with short and uniformly arched thorax. Nests in the ground; sometimes in termitaria. (Australian, Papuan).

Type: *Camponotus capito* Mayr (Wheeler, 1913; Emery, 1920).

Subgenus **Myrmogonia** Forel

Characterized by the thorax of the worker, which in profile is strongly curved, convex and not interrupted. Epinotum compressed and reduced to a ridge on the dorsum. The remainder as in the species with short and high thorax of the preceding subgenus. Nests in the ground. (Australian) . . Type: *Camponotus laminatus* Mayr.

Subgenus **Myrmosaga** Forel

Head of the worker major broad and emarginate behind; that of the worker minor truncate behind, with rounded posterior angles and parallel sides. Clypeus generally with a short, rounded lobe, sometimes truncate, the lateral portions, as a rule, very distinct. Thorax in profile with the same three characteristics as in the subgenus *Myrmophyma*. Pronotum never margined. Scale of the petiole more or less thickened. Integument always shining and finely sculptured. In the male of *C. gibber* the ocelli are placed on the protuberance of the vertex. (Malagasy).

Type: *Camponotus kelleri* Forel (Wheeler, 1913); *C. quadrimaculatus* Forel (Forel, 1914).

Subgenus **Mayria** Forel

Differs from the other subgenera in the low, short, and narrow first segment of the gaster. Small, smooth, with the thorax as in *Myrmoturba*, and 6-toothed mandibles. Habits unknown. Emery is inclined to unite this with *Myrmosaga*. (Malagasy) . . . . Type: *Mayria madagascariensis* Forel (=*Camponotus repens* Forel).

Subgenus **Myrmonesites** Emery

No great difference between the worker major and the worker minor. Head rounded trapezoidal, broader behind, obtuse in front. Clypeus strikingly short, its anterior margin rounded; in *C. mocquerysi* narrowly notched in the middle. Mandibles short. Thorax with pronounced sutures; pronotum depressed and, as a rule, obtusely margined; a more or less pronounced notch on the dorsum in front of the epinotum, which is differently shaped in the several species. Metanotum not apparent on the dorsum, but its spiracles are visible from above. Scale of the petiole more or less thickened and low. (Malagasy)............Type: *Camponotus putatus* Forel.

Subgenus **Myrmopytia** Emery

Includes only *C. imitator* Forel, of Madagascar, which is quite distinct especially in the structure of the thorax of the worker.

Subgenus **Myrmentoma** Forel

Body shining. Clypeus narrow, with deep foveæ, extending almost over the whole of its lateral portions; the anterior margin with a median, very distinct notch. Dorsum of the thorax either continuous or interrupted in profile. Head of the male short, the funiculus with short joints. (Holarctic)....Type: *Formica lateralis* Olivier.

Subgenus **Orthonotomyrmex** Ashmead (=*Orthonotus* Ashmead)

Species, as a rule, of heavy build, with opaque integument, sometimes silky, or with a few short, coarse and obtuse hairs. The size of the workers varies but little, as a rule. Head of the worker major very broad behind, never truncate in front; that of the worker minor trapezoidal, broadened behind. Clypeus with or without lobe. Dorsum of the thorax more or less interrupted by a notch in front of the epinotum; sometimes the dorsum is even and the mesoëpinotal suture alone is deeply marked, the epinotum itself being margined on the sides and behind (as in *C. robustus*); the epinotum is usually margined, rarely forming a rounded protuberance (*C. dofleini; C. wasmanni*). Pronotum margined or not margined, sometimes with projecting humeral angles; in *C. wasmanni* it is armed with a pair of short spines. Scale of the petiole squamiform or nodiform. (Ethiopian, Malagasy, Mediterranean, Indomalayan)..Type: *Formica sericea* Fabricius (Ashmead, 1905; Wheeler, 1913; Emery, 1920).

Subgenus **Myrmotrema** Forel

Size and head of the worker as in the preceding subgenus. Thorax with or without dorsal notch. In the worker major and female the anterior part of the head is covered with round pits, deeply cut in as though made with a punch. (Ethiopian, Malagasy, one species in India)..........Type: *Camponotus foraminosus* Forel.

Subgenus **Myrmopiromis** Wheeler (=*Myrmepomis* Emery, 1920; not of Forel, 1912)

Head as in the preceding subgenus, but without the deep pits on the cheeks of the worker major and female; pronotum often margined and sometimes with raised humeri (*C. fulvopilosus, C. ellioti, C. themistocles*). Most of the species have coarse, obtuse hairs, pale colored (white, yellow, or russet), more or less abundant, sometimes forming a fur-coating on the gaster or on the dorsum of the thorax (Ethiopian, Malagasy)................................Type: *Formica fulvopilosa* De Geer.

Subgenus **Myrmorhachis** Forel (=*Myrmacantha* Emery)

Head obtusely truncate in front. Thorax broad and with humeral angles; or the pronotum rounded (*C. aberrans*), in which case the scale of the petiole bears lateral appendages. Petiole variable, nodiform or squamiform, always at least angulose on the sides. Epinotum very variously shaped. (Ethiopian, Malagasy, Indomalayan)........................Type: *Camponotus polyrhachioides* Emery.

Subgenus **Myrmopsamma** Forel

Mandibles 5-toothed. Clypeus without carina. Anterior margin of the head below and above, and often also the upper third of the clypeus, with transversal rows of long, psammophorous setæ. Size and shape of the body as in *Myrmoturba* and *Camponotus, sensu stricto*. Sometimes the scape has an anterior tooth-like edge at the base. Arenicolous. (Ethiopian) ....Type: *Camponotus mystaceus* Emery.

Subgenus **Myrmamblys** Forel (=*Myrmotemnus* Emery, in part)

Differs from the Neotropical *Neomyrmamblys* in the integument which is, as a rule, shining, even on the head of the worker minor, more or less sculptured on that of worker major, soldier and female; in the thorax of the worker being more or less depressed on the dorsum, especially in the species of Malasia. The dimorphism is variously shown in the head, which is more or less truncate in front, the clypeus being always entirely included in the truncation. The antennæ are inserted much in front of the middle of the frontal carinæ (as in *Colobopsis*). There are no transitional forms between worker major and minor. This group is very heterogeneous. (Ethiopian, Asiatic, Indomalayan, Australian)..........Type: *Camponotus reticulatus* Roger.

Subgenus **Myrmosphincta** Forel

I retain in this group the Neotropical forms which Emery proposed transferring to his subgenus *Myrmotemnus* (=*Myrmamblys* Forel), but which do not seem to fit well there, though agreeing with it in most of their characters.

Type: *Formica sexguttata* Fabricius.

Subgenus **Rhinomyrmex** Forel

Clypeus strongly vaulted and carinate, always forming a beak or nose in front. The single species is imperfectly known. (Sumatra)..Type: *Rhinomyrmex klæsii* Forel.

Subgenus **Colobopsis** Mayr

Soldier or worker major and female with the head decidedly truncate in front, the flattened portion often sharply margined; the lower part of the clypeus is left out of the truncation so as to make an angle with its posterior narrow portion. Frontal carinæ diverging, comparatively short, straight or feebly sigmoid; the articulation of the antennæ placed in the middle or behind the middle of these carinæ. In most cases there is no transition between the soldier and the worker minor. Nest in tree-trunks, branches, empty galls, and hollow thorns. (Palearctic, Nearctic, Neotropical, Indomalayan, Australian; the Malagasy species is doubtful).

Type: *Formica truncata* Spinola.

Subgenus **Neomyrmamblys** Wheeler (=*Myrmamblys* Emery, 1920; not of Forel, 1912)

Dimorphism of the workers generally well pronounced in the shape of the head, which is often broad and rounded on the sides, truncate or emarginate behind and more or less obtuse in front in the worker major (*C. punctulatus*, *C. fastigatus*, etc.), or long with the sides more or less parallel and sometimes subtruncate in front (*C. novogranadensis*, *C. personatus*, etc.). Clypeus of the worker minor usually with rounded anterior margin; that of the worker major without lobe. Dorsum of the thorax continuous, without notch. Integument usually opaque. (Neotropical).

Type: *Camponotus fastigatus* Roger.

Subgenus **Paracolobopsis** Emery

Head of the worker minor rectangular, with the sides compressed as in several *Myrmobrachys;* that of the worker major with the sides parallel or converging in front, obtusely truncate, as in *Colobopsis*, so that the carinate clypeus, protuberant in profile, is only partly comprised in the truncation. Frontal carinæ sigmoid, with the articulation of the antennæ placed much before their middle. Thorax in profile making a continuous curve; pronotum depressed, more or less margined in front. Integument sculptured and at least partly opaque; the head of the worker major is entirely opaque. There are transitions between the worker major and minor. (Neotropical).
Type: *Camponotus salvini* Forel.

Subgenus **Pseudocolobopsis** Emery

Head of the worker minor elongate, rounded behind, with nearly parallel lateral sides, shining; that of the worker major more or less rectangular, obtuse or truncate in front; sometimes the truncation has a well-defined margin and then includes the entire clypeus. Integument of the head of the worker major and female more or less sculptured, at least in its anterior portion. Dorsum of the thorax arched and continuous. (Neotropical) .... Type: *Camponotus macrocephalus* Emery.

Subgenus **Myrmostenus** Emery

Only the female is known. Body extremely lengthened; head very long, narrow, and depressed. The workers may prove to be like those of the preceding subgenus. (Neotropical) .... Type: *Camponotus mirabilis* Emery.

Subgenus **Hypercolobopsis** Emery

In the type species the head of the soldier and female is excessively truncate: the oblique anterior face is flat, enclosed by a distinct margin, and contains the entire clypeus and part of the frontal carinæ, so that the articulation of the antennæ is placed just at the limit of the truncation; the head of the worker is narrowed behind as in certain species of *Myrmoturba* and *Dinomyrmex*. The soldier of *C. burtoni* Mann is much as in the type; its worker is unknown. *C. tonduzi*, which is also included by Emery, has the head of the worker shaped as in the type species, but that of the soldier has no distinctly truncate face. (Neotropical).
Type: *Colobopsis paradoxa* Mayr.

Subgenus **Myrmobrachys** Forel

Similar to *Myrmotrema*, but without fossæ on the cheeks and with the thorax generally broader at the epinotum, often subdepressed, though not margined or only submargined As a rule, small and thick-set, often pilose or pubescent. Often living in dry and hollow branches; sometimes in the ground; some species use their larvæ to spin silk nests. (Neotropical) .... Type: *Formica senex* F. Smith.

Subgenus **Myrmocladœcus** Wheeler (=*Myrmorhachis* Emery, 1920; not of Forel, 1912)

Thorax usually margined, often bidentate or bispinose Scale of petiole often spinose or mucronate. Usually small and somewhat like *Polyrhachis*. Thorax sometimes with a dorsal depression. In one species, pronotum dentate. Nests in hollow twigs. (Neotropical) .... Type: *Camponotus latangulus* Roger.

Subgenus **Myrmeurynota** Forel

Pronotum very broad, with a lateral, lamelliform margin, often vaulted. Thorax rapidly narrowing behind. Epinotum very narrow at its sloping face, which often has a peculiar appendage. Gaster broad, short, and small, sometimes more or less spherical. Probably arboreal. (Neotropical).

Type: *Camponotus eurynotus* Forel (Wheeler, 1913); *C. gilviventris* Roger (Forel, 1914).

Subgenus **Manniella** Wheeler

In the maxima worker the anterior truncated portion of the head is strongly carinate at the sides and posteriorly depressed; the front is strongly depressed between the carinæ, the depression margined behind with an elevated ridge. The remainder much as in *Myrmeurynota*. Nest in stalks or twigs. (Neotropical).

Type: *Camponotus sphæricus* Roger.

Subgenus **Myrmomalis** Forel

The entire body depressed in the worker and female, especially in the worker of *C. obtritus* which is completely flattened. Head rectangular in the worker major; elongate, trapezoidal in the worker minor; eyes placed laterally and behind the middle. Dorsum of the thorax flat; scale of the petiole low and thick. Integument black, opaque and pilose. Legs long, compressed, hirsute. (Neotropical).

Type: *Camponotus depressus* Mayr.

VIII.—A SYNONYMIC LIST OF THE ANTS OF THE ETHIOPIAN REGION

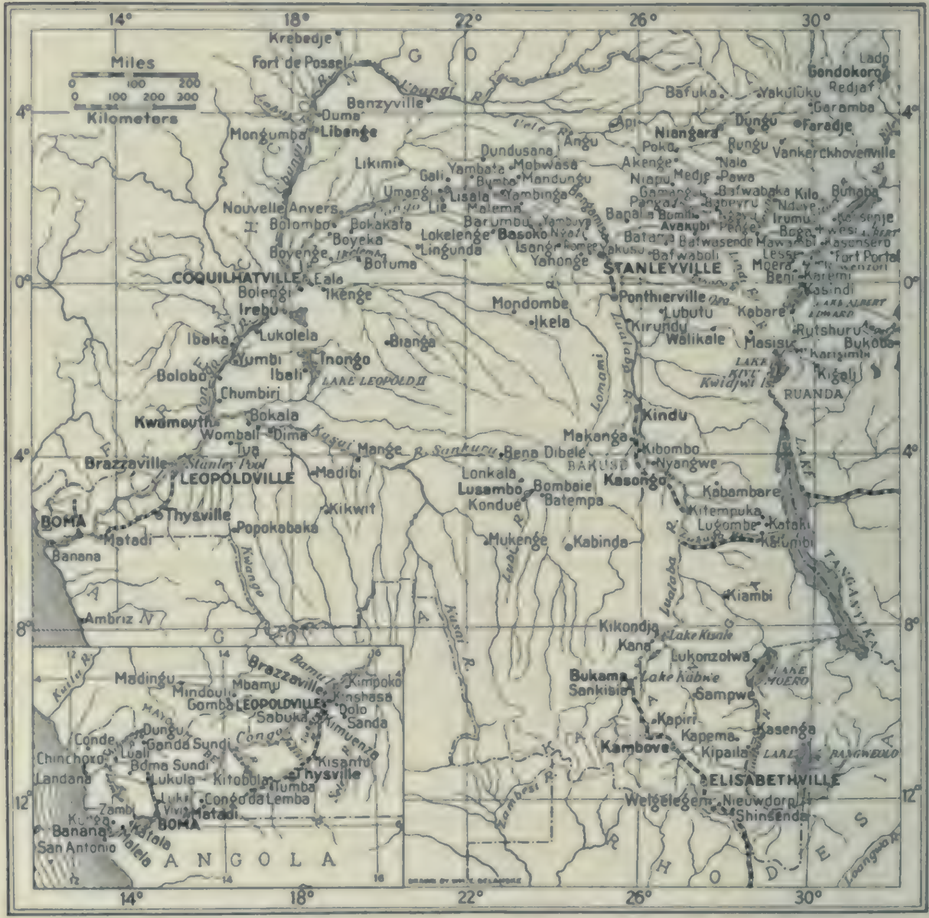
By Wm. M. Wheeler

The following catalogue of the known Ethiopian and Malagasy Formicidæ had its inception in an attempt to master the abundant and widely scattered literature as a basis for the study of the Congo ants collected by Messrs. Lang, Chapin, and Bequaert. The attempt was the more urgent because no general list had been published since the appearance of the seventh volume of Dalla Torre's 'Catalogus Hymenopterorum,' which included the forms known in 1890. He cites only 228 Ethiopian and 119 Malagasy species. It will be seen that the numbers have risen during the past thirty years to 920 and 237 respectively, almost exclusively as the result of the untiring labors of five myrmecologists: Mayr, Emery, Forel, Santschi, and Arnold. Had the varieties and subspecies been included in the foregoing estimates, the numbers would be still more impressive. Those who may believe that little entomological exploration has been carried out in the dark continent will also be astonished when they scan the lists of localities and the names of the collectors who have secured the materials for the taxonomists. It almost seems as if ant-collectors had been more numerous and more diligent in Africa than in North America!

I have endeavored to include all the literature on Ethiopian and Malagasy ants down to January 1st, 1920, together with some of the papers that have since appeared, but no claim for completeness is made for this year. Except in a very few instances the references have been checked up with the original papers by Dr. Bequaert, who has also gone to much pains in looking up species not contained in my original list, in arranging the species and genera and in many other ways relieving me of the meticulous and often exasperating labor of giving the catalogue its present appearance.

The localities recorded for the various forms have been grouped geographically according to the political divisions in use at the beginning of 1914. So far as possible the spelling of the geographical names has been made uniform throughout, though this has been very difficult owing to the typographical and other errors so numerous in taxonomic papers.

With Emery and other zoologists I have called the category below the species "subspecies," not "race," or "stirps," as is the custom with Forel, Santschi and Arnold. I have, moreover, given both the subspecific and varietal names the same gender as the corresponding specific names, departing in this respect from the procedure of other myrmecologists, who treat the subspecific or at least the varietal name as feminine, irrespective of the gender of the specific name. My reasons for this departure are two-fold: First, ornithologists, mammalogists, herpetologists and others who employ trinomials make the subspecific as well as the specific names agree with the generic name in gender, and I am unable


14°
18°
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Krebedje
Fort de Possel
Banzyville
Ubangi R.
Duma
Libenge
Mongumba
Likimi
Gali
Yambata
Mobwasa
Bumba
Mandungu
Umangi
Lisala
Yambinga
Malema
Dundusana
Angu
Uele R.
Bafuka
Yakuluku
Lado
Gondokoro
Redjaf
Garamba
Faradje
Api
Niangara
Dungu
Poko
Rungu
Vankerckhovenville
Akenge
Niapu
Medje
Nala
Pawo
Bafwabaka
Kilo
Bunia
Gamangui
Panga
Babeyru
Banalia
Avakubi
Penge
Irumu
Beni
Bafwasende
Bafwaboli
Lesse
Moera
Kasindi
Fort Portal
LAKE ALBERT
LAKE EDWARD
Nouvelle Anvers
Bolombo
Bokakata
Boyeka
Boyenge
Botuma
Lie
Barumbu
Lokelenge
Basoko
Lingunda
Isangi
Yakusu
Yahonge
STANLEYVILLE
Ponthierville
Lubutu
Kirundu
Walikale
Kabare
Masisi
Rutshuru
Bukoba
LAKE KIVU
Kwidjwi Is.
Kigali
RUANDA
COQUILHATVILLE
Eala
Bolengi
Ikenge
Irebu
Mondombe
Ikela
Ibaka
Lukolela
Bianga
Yumbi
Inongo
Bolobo
Ibali
LAKE LEOPOLD II
Chumbiri
Lomami
Lualaba R.
Kindu
Kwamouth
Bokala
Wombali
Dima
Tya
Kasai R.
Mange
Sankuru R.
Makanga
Bena Dibele
Kibombo
Nyangwe
BAKUSU
Kasongo
Brazzaville
Stanley Pool
LEOPOLDVILLE
Madibi
Lonkala
Lusambo
Bombaie
Batempa
Kondue
Kabambare
Kikwit
BOMA
Thysville
Matadi
Popokabaka
Kitempuka
Lugombe
Kataki
Albertville
Kalumbi
Banana
Mukenge
Kabinda
Lubi R.
Lualaba
Kiambi
Kwango
Kasai R.
Ambriz
LAKE TANGANYIKA
Kikondja
Lake Kisale
Kana
Lukonzolwa
LAKE MOERO
Bukama
Lake Kabwe
Sankisia
Sampwe
Kapiri
Kasenga
Kapema
Kambove
Kipaila
LAKE BANGWEOLO
ELISABETHVILLE
Welgelegen
Nieuwdorp
Shinsenda
Zambesi R.
Loangwa R.
RHODESIA
ANGOLA
Madingu
Mindouli
Mbamu
Brazzaville
Kimpoko
Kinshasa
Gombe
LEOPOLDVILLE
Dolo
Sabuka
Sanda
Kimuenza
Dungu
Conde
Ganda Sundi
Congo
Chinchoxo
Luali
Kisantu
Boma Sundi
Landana
Lukula
Kitobola
Thysville
Tumba
Zambi
Vivi
Congo da Lemba
Matadi
BOMA
Banana
San Antonio
Kuilu R.
MAYOMBE
A N G O L A
12
14
16

Map 47. Showing localities in the Belgian Congo where ants have been collected.

to see why quadrinomials should be treated differently. Second, the status of the specific, subspecific and varietal categories in myrmecography are still in a state of flux, and since different writers and even the same writer on different occasions are in the habit of exalting varieties or subspecies to specific rank and degrading species to varietal or subspecific rank—a process which must continue till knowledge of a particular species-complex sufficient to establish the precise dignity of its various categories is attained—it is obviously preferable to keep the names all of one gender.

The confusion introduced into the literature by this at present unavoidable inconsistency and instability in the employment of specific, subspecific and varietal names makes it necessary in the compilation of such a catalogue as the following to choose between different appreciations or even to rely altogether on one's own interpretation. This is particularly the case in dealing with large, complex genera such as *Pheidole*, *Crematogaster*, *Monomorium*, *Tetramorium*, *Camponotus*, and *Polyrhachis*. I gladly admit that my judgment may have been at fault in several of my appraisals of taxonomic status, especially of forms unknown to me in nature. A catalogue, however, is not a place for disputation or the weighing of evidence but merely a condensed expression of a small fragment of our present taxonomic knowledge, compiled under rigid limitations of space and conventions of arrangement. That my work will be subjected to criticism by those who have never attempted to deal with a similar body of taxonomic literature, is to be expected, but I am certain that students will find it very useful, at least till it is absorbed at some future time in a much ampler and more perfect conspectus of the Ethiopian and Malagasy ant-fauna.

Approximate Location of African Localities, Rivers, Mountains, Lakes, etc., Mentioned in the Catalogue of Ethiopian Ants and Elsewhere in the Paper[1]

Ababis.—22° 10′ S., 15° 45′ E.
Abaja (L.).—6° 30′ N., 38° E.
Abba (I.).—13° 20′ N., 32° 40′ E.
Aberdare (Mts.).—0° 30′ S., 37° E.
Aberdeen.—32° 25′ S., 24° 5′ E.
Aberio.—10° N., 44° 35′ E.
Abo.—5° 30′ N., 6° 25′ E.
Abo (R.).—4° 15′ N., 9° 45′ E.
Abou.—8° 50′ N., 38° 35′ E.
*Abuker.—Near Dire Daua, Abyssinia.
Aburi.—5° 45′ N., 0° 10′ W.
Addah.—5° 55′ N., 0° 35′ E.
Aden.—12° 50′ N., 45° E.
Adi Caie.—14° 50′ N., 39° 20′ E.
Adis-Abeba.—9° N., 38° 45′ E.
Adi Ugri.—14° 55′ N., 38° 50′ E.
Adua.—14° 10′ N., 38° 55′ E.
Agege.—6° 40′ N., 3° 20′ E.
Agouagon.—8° N., 2° 20′ E.
*Aguagua.—Lower Dahomey. Probably misspelling for Agouagon.
Aikota.—15° 10′ N., 37° 5′ E.
Ain (Mt.).—12° 45′ N., 33° 5′ E.
Akaki (R.).—8° 50′ N., 38° 40′ E.
Akenge.—2° 55′ N., 26° 50′ E.
Akono Linga.—3° 55′ N., 12° 45′ E.
Akra.—5° 40′ N., 0° 15′ W.
Akropong.—6° N., 0° 5′ W.
Akwapim (Mts.).—5° 50′ N., 0° 20′ W.
Albany.—33° 20′ S., 26° 25′ E.
Albert Edward (L.).—0° to 0° 30′ S., 29° 30′ E.
Alen.—2° 5′ N., 11° E.
Algoa Bay.—33° 45′ S., 25° 45′ E.; same as Port Elizabeth.
Algota.—15° 45′ N., 38° 55′ E.
Alto Queta.—9° 15′ S., 14° 55′ E.
Amani.—5° 5′ S. 38° 40′ E.
Amanzimtoti.—30° 5′ S., 30° 50′ E.
Amarr Burgi.—5° 25′ N., 37° 55′ E.
Amatongas Forest.—19° S., 33° 40′ E.
Ambas Bay.—4° N., 9° 10′ E.
Ambelokudi.—Near Pawa, Belgian Congo.
Amboni (R.).—0° 20′ S., 36° 55′ E.
Ambriz.—7° 45′ S., 13° 5′ E.
Amu (R.).—7° 20′ N., 1° 10′ E.
Angra Pequena.—26° 40′ S., 15° 10′ E.; same as Lüderitz Bay.
Angu.—3° 30′ N., 24° 20′ E.
Annobon (I.).—1° 15′ S., 6° E.
Anseba (R.).—15° to 17° 10′ N., 38° 45′ to 39° E.
Antongil Bay.—15° 30′ S., 49° 50′ E.
Aouache (R.), same as Hauash (R.).
Api.—3° 40′ N., 25° 25′ E.
Arasab (R.).—26° 55′ to 27° 10′ S., 16° 15′ to 16° 35′ E.
Arigalgalu.—4° 25′ N., 39° 55′ E.
Artesia.—24° 5′ S., 26° 20′ E.
Arusha-chini.—3° 35′ S., 37° 25′ E.
Arussi Galla, Ganale Gudda.—7° 30′ N., 40° 15′ E.
Aruwimi (R.).—1° 20′ N., 27° 40′ E.
Asmara.—15° 20′ N., 39° E.
Assab.—13° 5′ N., 42° 50′ E.
Assinie.—5° N., 3° 20′ W.
Assuan.—24° 5′ N., 32° 50′ E.
Atbara (R.).—12° 30′ to 17° 40′ N., 34° to 37° E.
Athi Plain.—1° 20′ S., 37° 10′ E.
Auata (R.).—5° 15′ to 6° N., 38° 50′ to 39° 10′ E.
Avakubi.—1° 20′ N., 27° 40′ E.

Babeyru.—1° 55′ N., 27° 40′ E.
Bachi-Shombe.—4° 55′ S., 20° 35′ E.
Bafuka.—4° 20′ N., 27° 50′ E.
Bafwabaka.—2° 10′ N., 27° 50′ E.
Bafwalipa.—1° 30′ N., 27° 45′ E.
Bafwasende.—1° 10′ N., 27° 15′ E.
Bagamoyo.—6° 25′ S., 38° 55′ E.
Baguirmi.—12° 20′ N., 15° to 17° E.

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[1] Localities marked with an asterisk have not been found on any map.

Bahr-el-Salaam.—12° 55′ to 13° 50′ N., 36° 10′ to 37° 30′ E.

*Bakaie.—Between Nyangwe and Stanleyville, Belgian Congo.

Bakusu.—3° 35′ S., 25° 30′ E.

Balgowan.—29° 20′ S., 30° 5′ E.

Balla Balla.—20° 25′ S., 29° 20′ E.

*Balli Neck Pass.—Ex-German Southwest Africa.

Bamako.—12° 40′ N., 7° 55′ W.

*Bamayanga.—Belgian Congo.

Bamba.—7° S., 13° 40′ E.

Bambaya.—10° 45′ N., 13° 35′ W.

Bamu (I.).—4° 25′ S., 15° 30′ E.

Banalia.—1° 30′ N., 25° 40′ E.

Banana (Lower Congo).—6° S., 12° 20′ E.

Banana (Ituri Forest).—1° 20′ N., 29° 15′ E.

Banas.—3° 55′ N., 40° 15′ E.

Bangala, see Nouvelle Anvers.

Bangweolo (L.).—11° S., 30° E.

Banza Masola.—5° 10′ S., 13° E.

Banzyville.—4° 15′ N., 21° 10′ E.

Barawa.—1° 5′ N., 44° 5′ E.

Barberton.—25° 50′ S., 31° E.

Bargunett (R.), Mt. Kenia.—0°, 37° E.

Barikiwa.—9° 30′ S., 37° 55′ E.

*Barko.—Abyssinia.

Barombi (L.).—4° 40′ N., 9° 25′ E.

Barumbu.—1° 10′ N., 23° 20′ E.

Basoko.—1° 20′ N., 23° 35′ E.

Bassam, see Grand Bassam.

Bass Marle, see Stephanie (L.).

Bass Narok, see Rudolf (L.).

Basutoland.—28° 35′ to 30° 35′ S., 27° 5′ to 29° 20′ E.

Bata.—1° 50′ N., 9° 45′ E.

Batama.—1° N., 26° 40′ E.

Batanga.—2° 50′ N., 9° 55′ E.

Batempa.—5° S., 23° 45′ E.

Bathurst.—13° 30′ N., 16° 45′ W.

*Batiamponde.—Near Stanleyville, Belgian Congo.

Bawi (I.).—6° 10′ S., 39° 5′ E.

*Bazen.—Abyssinia.

*Beach Bush.—Near Durban, Natal.

*Bedza.—Matoppo Hills, Southern Rhodesia.

Beira.—20° S., 35° E.

Bela.—4° N., 41° 30′ E.

Belingwe.—20° 25′ S., 30° E.

Bembesi (R.).—19° to 20° S., 28° to 29° 30′ E.

Bena Dibele.—4° S., 22° 45′ E.

Bena Makima.—4° 45′ S., 20° 45′ E.

*Benda.—French Congo.

Bendo.—6° 55′ N., 11° 15′ W.

Bengamisa.—1° N., 25° 10′ E.

Benguela.—12° 30′ S., 13° 20′ E.

Beni.—0° 20′ N., 29° 40′ E.

Benin.—6° 20′ N., 5° 40′ E.

Benito (R.).—1° 35′ N., 9° 35′ E.

Benue (R.).—8° N., 7° to 10° E.

Berbera.—10° 25′ N., 45° 5′ E.

*Bergvliet.—Cape Flats, Cape Colony.

Bethanien.—26° 30′ S., 17° 10′ E.

*Betutu.—Maringa-Lopori District, Belgian Congo.

Bianga.—1° 25′ S., 20° 10′ E.

Bibundi.—4° 15′ N., 9° E.

Bihunga.—0° 20′ N., 30° 5′ E.

Bindura.—17° 25′ S., 31° 25′ E.

Bipindi.—3° 5′ N., 10° 25′ E.

*Bisa Timo.—Near Harar, Abyssinia.

Bismarckburg.—8° 5′ N., 1° 20′ E.

Bismarckhügel.—3° 5′ S., 37° 30′ E.

Bissao.—11° 45′ N., 15° 40′ W.

Bissis (I.).—11° 45′ N., 16° 5′ W.

Bizen (Mt.).—15° 20′ N., 39° 10′ E.

Blantyre.—15° 45′ S., 35° 5′ E.

Bloemfontein.—29° 5′ S., 26° 10′ E.

Blue Cliff.—33° 30′ S., 25° 25′ E.

Blue Nile (R.).—11° 15′ to 15° 40′ N., 32° 25′ to 35° E.

Blue Post.—1° 5′ S., 37° 10′ E.

*Bobi.—Near Gali, Belgian Congo.

*Boda.—French Congo.

Boga.—1° N., 30° E.

Bogos.—15° 50′ N., 38° E.

Bokakata.—1° 10′ N., 19° 25′ E.

Bokala.—3° 15′ S., 17° 5′ E.

Bolengi.—0° 5′ S., 18° 10′ E.

Bolobo.—2° 15′ S., 16° 15′ E.

Bolombo.—1° 25′ N., 18° 55′ E.
Boma.—5° 50′ S., 13° 10′ E.
*Boma Gombe.—German East Africa.
Boma Sundi.—5° 20′ S., 12° 50′ E.
Bombaie.—4° 50′ S., 23° 35′ E.
Bomili.—1° 30′ N., 27° 20′ E.
Bondei.—5° 20′ S., 38° 50′ E.
Bonjongo.—4° 5′ N., 9° 10′ E.
Bonny (R.).—4° 25′ to 4° 45′ N., 7° 10′ E.
Boran Galla, Upper Ganale.—4° 30′ N., 39° 30′ E.
*Borda.—French Congo.
*Boro (R.).—Darbanda, French Congo.
Bothaville.—27° 20′ S., 26° 35′ E.
Botuma.—0° 30′ N., 19° 30′ E.
Bourka.—9° 25′ N., 41° 15′ E.
Boyeka.—1° 10′ N., 19° 5′ E.
Boyenge.—0° 25′ N., 18° 45′ E.
Boyulu.—1° N., 27° E.
Brazzaville.—4° 25′ S., 15° 20′ E.
Buarsangueli.—10° 50′ N., 48° E.
Bububu.—6° 5′ S., 39° 20′ E.
Buddu Forest.—1° S., 31° 40′ E.
Buditu.—5° 25′ N., 38° 30′ E.
Bugalla (I.).—0° 30′ S., 32° 15′ E.
Buiko.—4° 42′ S., 38° E.
Bujongolo.—0° 20′ N., 29° 55′ E.
Bukama.—9° 15′ S., 25° 40′ E.
Bukoba.—1° 30′ S., 32° E.
Bularli.—7° 55′ N., 43° 30′ E.
Bulawayo.—20° 10′ S., 28° 50′ E.
Bumba.—2° 10′ N., 22° 30′ E.
*Bunthorne Mine. — Near Bulawayo, Rhodesia.
Bura.—3° 30′ S., 38° 18′ E.
Butiaba.—1° 50′ N., 31° 30′ E.
Butiti.—0° 45′ N., 30° 20′ E.
Buzubizi.—0° 20′ N., 32° 5′ E.

Caconda.—13° 45′ S., 15° E.
Cairo.—30° 12′ N., 31° 10′ E.
Caledon.—34° 10′ S., 19° 25′ E.
Camayenne.—9° 25′ N., 13° 40′ W.
Cameroon (Mt.).—4° 15′ N., 9° 10′ E.
Cameroon (R.).—3° 55′ N., 9° 35′ E.
Campo.—2° 20′ N., 9° 50′ E.
Campo Tembo.—3° 5′ S., 38° 10′ E.
*Candolo.—Belgian Congo.
Cape Cross.—21° 45′ S., 13° 55′ E.
Cape Flats.—Near Cape Town, Cape Colony.
Cape Lopez.—0° 40′ S., 8° 45′ E.
Cape Mount.—6° 45′ N., 11° 25′ W.
Cape of Good Hope.—34° 15′ S., 18° 30′ E.
Cape Palmas.—4° 30′ N., 7° 35′ W.
Cape Town.—33° 55′ S., 18° 25′ E.
Cape Verde.—14° 35′ N., 17° 50′ W.
Casamance (R.).—12° 40′ N., 14° to 16° 45′ W.
*Cawston Farm.—On Umgusa R., Southern Rhodesia.
Ceres.—33° 25′ S., 19° 20′ E.
Chacansengula.—0° 20′ N., 31° 55′ E.
Chakamakue.—23° 45′ S., 22° 5′ E.
Chake Chake, Pemba Island.—5° 15′ S., 39° 45′ E.
Chama.—5° N., 1° 40′ W.
Changamwe.—4° 2′ S., 39° 35′ E.
*Changmane, probably Changamwe.
Chania (R.).—0° 40′ to 1° 10′ S., 36° 50′ E.
Charlestown.—27° 25′ S., 29° 55′ E.
Cheik Osman.—12° 55′ N., 45° E.
Cheteni.—4° 5′ S.,39° 40′ E.
Chikai.—5° 50′ S., 12° 25′ E.
Chinchoxo.—5° 15′ S., 12° 15′ E.
Chirinda (Mt.).—21° S., 32° 45′ E.
Chumbiri.—2° 40′ S., 16° 15′ E.
*Ciuma.—Southern Rhodesia.
Coffee (Mt.).—6° 30′ N., 10° 35′ W.
*Colba (R.).—Abyssinia.
Colenso.—28° 45′ S., 29° 50′ E.
*Comba Ibre.—French Congo.
*Combra Tora.—French Congo.
Conde.—5° 5′ S., 12° 15′ E.
Congo da Lemba.—5° 40′ S., 13° 40′ E.
Constantia, near Cape Town.—34° 5′ S., 18° 25′ E.
Conway.—31° 45′ S., 25° 15′ E.
Coquilhatville.—0° 1′ N., 18° 20′ E.
Coromma.—5° 30′ N., 38° E.
Cubango (R.).—12° 30′ to 20° S., 16° 15′ to 22° 30′ E.

*Cucala.—Portuguese West Africa.
Cuito (R.).—12° 35′ to 18° S., 18° to 20° 30′ E.

Dakar.—14° 40′ N., 17° 35′ W.
Damba (I.).—0°., 32° 50′ E.
Danakil.—12° N., 42° E.
Daouele.—8° 45′ N., 44° 5′ E.
Darbanda.—7° 40′ N., 21° 35′ E.
Daressalaam.—6° 50′ S., 39° 15′ E.
Daua (R.).—4° to 5° 20′ N., 39° 10′ to 42′ E.
De Aar.—30° 40′ S., 24° 5′ E.
Deep (R.).—34° 5′ S., 18° 25′ E.
*Degabolla.—Abyssinia.
Delagoa Bay.—26° S., 32° 40′ E.
*Denge.—Near Niangara, Belgian Congo.
Diagbe (R.).—4° 30′ N., 28° 25′ E.
Dibele.—4° S., 22° 45′ E.; same as Bena Dibele.
Dima.—3° 20′ S., 17° 20′ E.
Dimbroko.—6° 40′ N., 4° 55′ W.
Dimé.—5° 35′ N., 36° 50′ E.
Diré Daua.—9° 40′ N., 41° 50′ E.
Djebel Akhmed Aga.—11° N., 33° E.
Djebel Hakim.—9° 25′ N., 42° 25′ E.
Djipe (L.).—3° 35′ S., 37° 45′ E.
Djougou.—9° 45′ N., 1° 50′ E.
Djur (R.).—8° N., 28° E.
Dolo.—4° 25′ S., 15° 25′ E.
*Dongola.—Eritrea.
Duala.—4° N., 9° 40′ E.
*Dukudu.—Zululand.
Duma.—3° 50′ N., 18° 35′ E.
Dunbrody.—33° 30′ S., 25° 30′ E.
Dundusana.—2° 45′ N., 22° 20′ E.
Dungu, Mayombe.—4° 45′ S., 12° 55′ E.
Dungu, Uele.—3° 30′ N., 28° 30′ E.
Durban.—29° 50′ S., 31° E.

Eala.—0° 1′ N., 18° 25′ E.
East London.—33° S., 27° 55′ E.
Ebolowa.—2° 55′ N., 11° 5′ E.
*Edeloud.—Kordofan Desert, Anglo-Egyptian Sudan.
Efulen.—2° 40′ N., 10° 45′ E.
*Ekeneli.—Near Metit, Cameroon.
Eket.—4° 35′ N., 7° 55′ E.
*Elat.—Near Metit, Cameroon.
El Burgon.—0° 15′ S., 35° 50′ E.
*El Hefera.—On the Settit, Anglo-Egyptian Sudan.
Elisabethville.—11° 45′ S., 27° 40′ E.
Ellahelaj.—7° N., 49° 20′ E.
Eloby (I.).—1° N., 9° 30′ E.
Endessa.—8° 40′ N., 40° E.
Entebbe.—0° 5′ N., 32° 30′ E.
*Entendweni.—Zululand.
Epulu (R.).—1° 20′ N., 28° 40′ E.
Erdal.—5° 30′ N., 48° 45′ E.
Errer-es-Saghir.—9° 30′ N., 44° 5′ E.; same as Hargeisa.
Estcourt.—29° S., 29° 50′ E.
*Esuk Ekkpo Abassi.—Eket District, Nigeria.
*Etombe.—Cameroon.
Ettoke.—4° 40′ N., 39° E.

Faf Plain.—6° 30′ N., 44° 10′ E.
Falaba.—9° 45′ N., 11° 20′ W.
Faradje.—3° 40′ N., 29° 40′ E.
Fariala.—1° 25′ N., 28° E.
Fashoda.—10° N., 32° E.
*Fello.—Senegambia.
Fernando Po.—3° 30′ N., 8° 30′ E.
Fikilini, near Stanleyville.
Forcados (R.).—5° 20′ N., 5° 35′ to 6° 20′ E.
Fort Archambault.—9° 5′ N., 18° 35′ E.
Fort Crampel.—7° 10′ N., 9° 20′ E.
Fort de Possel.—5° N., 19° 15′ E.
Fort Hall.—0° 50′ S., 37° 15′ E.
Fort Johnston.—14° 30′ S., 35° 15′ E.
Fort Portal.—0° 45′ N., 30° 15′ E.
Fort Sibut.—5° 55′ N., 19° E.; same as Krebedje.
Freretown.—4° 3′ S., 39° 40′ E.
Fundu (I.).—5° 5′ S., 39° 40′ E.

Gaboon (R.).—0° 10′ to 0° 30′ N., 9° 20′ to 10° 10′ E.
*Galago (L.).—Northern Ruanda, German East Africa.
Gali.—2° 25′ N., 21° 35′ E.
Gamangui.—2° 10′ N., 27° 20′ E.

Ganale Gudda (R.).—5° 25′ to 6° N., 39° to 40° 45′ E.
Ganana (R.), see Ganale (R.).
Ganda Sundi.—4° 50′ S., 12° 50′ E.
Garamba.—4° 10′ N., 29° 40′ E.
Gawieb.—22° 45′ S., 15° 10′ E.
Gazi.—4° 25′ S., 39° 30′ E.
Gebelein, White Nile.—12° 35′ N., 32° 45′ E.
George.—33° 55′ S., 22° 30′ E.
Ghinda.—15° 35′ N., 39° E.
*Ghrab el Aish.—Anglo-Egyptian Sudan.
Giari Bule.—5° 55′ N., 38° 50′ E.
Gilgil.—0° 30′ S., 36° 20′ E.
*Gischin.—Southern Arabia.
Giuba (R.).—0° 10′ S. to 4° 5′ N., 42° 30′ E.
*Glatkop. — Little Namaland, Cape Colony.
Gobabis.—22° 25′ S., 18° 55′ E.
*Goda.—French Congo.
Godo Burka.—9° 5′ N., 39° 25′ E.
Gogfale.—9° 50′ N., 41° 20′ E.
Golah.—7° 5′ N., 8° 35′ W.
Golungo Alto.—9° 5′ S., 14° 55′ E.
Gomba.—4° 10′ S., 14° 20′ E.
Gomod.—15° 35′ N., 39° 10′ E.
Gondokoro.—4° 50′ N., 31° 45′ E.
Gordon Bay.—34° 10′ S., 18° 50′ E.
Gorée (I.).—14° 40′ N., 17° 30′ W.
Gorongoza.—18° 30′ S., 34° E.
Gotta.—9° 35′ N., 41° 20′ E.
Grahamstown.—33° 15′ S., 26° 35′ E.
Grand Bassa.—5° 45′ N., 10° W.
Grand Bassam.—5° 10′ N., 3° 50′ W.
Grand Batanga.—2° 50′ N., 9° 55′ E.
Grand Lahou.—5° 10′ N., 5° W.
*Greymine.—Natal.
Grootfontein.—19° 35′ S., 18° 55′ E.
Gubbet.—11° N., 47° 50′ E.
*Guengera.—Pungwe Valley, Portuguese East Africa.
Gwaai.—19° 20′ S., 27° 40′ E.

Haitajwa Cave.—6° 15′ S., 39° 15′ E.
Hamman's Kraal.—25° 25′ S., 28° 15′ E.
Harar.—9° 25′ N., 42° 25′ E.
Hargeisa.—9° 30′ N., 44° 5′ E.
Hartley.—18° 10′ S., 30° 30′ E.
Hauacio.—5° N., 39° E.
Hauash (R.).—8° 25′ to 11° 40′ N., 38° 25′ to 41° 30′ E.
Hebron.—25° 30′ S., 27° 55′ E.
Herrer.—9°40′ N., 41° 20′ E.
Herschel.—30° 40′ S., 27° 15′ E.
*Hiéka Bourka.—Abyssinia.
Hillside, near Bulawayo.—20° 10′ S., 28° 50′ E.
Himo (R.)., Mt. Kilimanjaro.—3° 10′ to 3° 35′ S., 37° 35′ E.
Hoima.—1° 35′ N., 31° 30′ E.
Homran.—14° 25′ N., 36° 10′ E.
Hope Fontain.—20° 20′ S., 28° 55′ E.
Hopetown.—29° 35′ S., 24° 5′ E.

Ibadan.—7° 25′ N., 3° 55′ E.
Ibaka.—1° 35′ S., 16° 40′ E.
Ibali.—2° S., 18° 10′ E.
Ibanda.—0° 20′ N., 30° 5′ E.
Ibo.—12° 25′ S., 40° 35′ E.
Ihulu (R.), same as Epulu (R.).
Ikela.—1° S., 23° 10′ E.
Ikelemba (R.).—0° 20′ N., 18° 15′ to 20° 20′ E.
Ikenge.—0° 5′ S., 18° 35′ E.
*Imbokro.—Ivory Coast. Probably misspelling of Dimbroko.
*Ingfal.—Abyssinia.
Inhambane.—23° 55′ S., 35° 35′ E.
*Injolo. — Equator District, Belgian Congo.
Inkisi (R.).—4° 40′ to 6° 15′ S., 15° to 15° 35′ E.
Inongo.—1° 55′ S., 18° 20′ E.
Irebu.—0° 35′ S., 17° 50′ E.
*Iringui.—Belgian Congo.
Irumu.—1° 20′ N., 30° E.
*Isalinio. — Mpororo, German East Africa.
Isangi.—0° 50′ N., 24° 15′ E.
Isipingo.—30° S., 30° 50′ E.
Issawe.—2° 35′ S., 29° 45′ E.
Itigi.—5° 45′ S., 34° 30′ E.
Ituri (R.).—1° 30′ N., 26° to 30° E.

Jabassi.—4° 30′ N., 9° 55′ E.
Jacqueville.—5° 15′ N., 4° 25′ W.

Johann-Albrechtshöhe.—4° 40′ N., 9° 25′ E.
Johannesburg.—26° 10′ S., 28° E.
Junk (R.).—6° 5′ to 6° 30′ N., 9° 35′ to 10° 25′ W.

Kabambare.—4° 40′ S., 27° 45′ E.
Kabanza, Lovoi R.—8° 15′ S., 26° 30′ E.
Kabare.—0° 35′ S., 29° 30′ E.
Kabinda.—6° 10′ S., 24° 20′ E.
Kabwe (L.).—9° 20′ S., 25° 50′ E.
Kadjura, Unyoro.—1° 40′ N., 31° 20′ E.
*Kafogo.—Limba, Sierra Leone.
Kagera (R.).—1° to 2° 30′ S., 30° to 31° 50′ E.
Kahe, Mt. Kilimanjaro.—3° 30′ S., 37° 25′ E.
*Kaibo.—Uganda.
Kairouan.—35° 40′ N., 10° 5′ E.
*Kaka.—Schoa, Abyssinia.
Kaka, White Nile.—10° 40′ N., 32° 15′ E.
*Kakir.—Kalahari.
Kakoulima (Mt.).—9° 40′ N., 13° 25′ W.
*Kalanga.—On the Upper Lukuga, Belgian Congo.
*Kalumba.—Belgian Congo. Probably Kalumbi.
Kalumbi.—5° 50′ S., 28° 35′ E.
Kamaggas.—29° 45′ S., 17° 25′ E.
Kambove.—10° 50′ S., 26° 35′ E.
Kamiti (R.).—1° 5′ S., 36° 50′ E.
Kampala.—0° 20′ N., 32° 20′ E.
Kana.—8° 25′ S., 26° 20′ E.
Kandahar (I.), Zambesi R.—17° 55′ S., 25° 35′ E.
Kang.—23° 40′ S., 22° 45′ E.
Kapema.—10° 40′ S., 28° 20′ E.
*Kapinga.—Belgian Congo.
Kapiri.—10° 15′ S., 26° 20′ E.
Karagwe.—1° to 2° S., 31° E.
Karemi.—0° 5′ N., 29° 40′ E.
Karisimbi (Mt.).—1° 30′ S., 29° 25′ E.
Karoli (Mt.).—3° 55′ N., 37° 30′ E.
Karssa.—9° 25′ N., 41° 35′ E.
Kasai (R.).—3° to 10° S., 16° to 22° E.
Kasenga.—10° 15′ S., 28° 45′ E.
Kasengui.—0° 20′ N., 31° 40′ E.
Kasindi.—0°., 29° 40′ E.
Kasongo.—4° 20′ S., 26° 25′ E.
Kasonsero.—1° N., 30° 10′ E.
Kassala.—15° 25′ N., 36° 25′ E.
Kassenje.—1° 25′ N., 30° 30′ E.
Kataki, Katanga.—5° 45′ S., 29° E.
Katala.—6° S., 12° 45′ E.
Katende.—0° 15′ N., 32° 25′ E.
*Katumba.—Belgian Congo.
Kavirondo Bay.—0° 20′ S., 34° 30′ E.
Kawa, White Nile.—13° 45′ N., 32° 30′ E.
Kazungula.—17° 50′ S., 25° 5′ E.
Kenia (Mt.).—0° 20′ S., 37° 25′ E.
Kentani.—32° 30′ S., 28° 20′ E.
Keren.—15° 45′ N., 38° 30′ E.
Kerreri.—15° 45′ N., 32° 30′ E.
Kgokong.—24° 15′ S., 23° E.
Khakhea.—24° 40′ S., 23° 25′ E.
Khami (R.).—20° 15′ S., 28° E.
Khartum.—15° 40′ N., 32° 35′ E.
Khutu Steppe.—7° 30′ S., 38° E.
Kiambi.—7° 20′ S., 27° 55′ E.
Kibombo.—4° S., 26° E.
Kibonoto, Mt. Kilimanjaro.—3° 15′ S., 37° 10′ E.
Kibosho.—3° 15′ S., 37° 20′ E.
Kibwezi.—2° 25′ S., 37° 55′ E.
Kifumbiro.—1° 15′ S., 31° 25′ E.
Kigali.—2° S., 30° E.
*Kigerama.—Near Kagera R., German East Africa.
Kihenga.—5° 45′ S., 37° 35′ E.
Kijabe.—0° 55′ S., 36° 35′ E.
Kika.—9° 15′ N., 2° 45′ E.
Kikondja.—8° 10′ S., 26° 25′ E.
Kikuyu.—1° 15′ S., 36° 45′ E.
Kikwit.—5° 25′ S., 18° 50′ E.
Kilema.—3° 20′ S., 37° 30′ E.
Kilimanjaro (Mt.).—3° S., 37° 20′ E.
Kilindini.—4° S., 39° 45′ E.
Kilo.—1° 55′ N., 30° E.
*Kilongalonga.—Near St. Gabriel, Belgian Congo.
*Kimaha.—Gold Coast.
Kimberley.—28° 45′ S., 24° 45′ E.
Kimpoko.—4° 10′ S., 15° 40′ E.
Kimuenza.—4° 25′ S., 15° 20′ E.

Kinangop.—0° 35′ S., 36° 30′ E.
Kindia.—10° N., 12° 45′ W.
Kindu.—3° S., 26° E.
King William's Town.—32° 50′ S., 27° 25′ E.
Kiniati.—5° 20′ S., 13° E.
Kinshasa.—4° 20′ S., 15° 20′ E.
Kipaila.—10° 45′ S., 28° 35′ E.
Kirstenbosch.—34° S., 18° 30′ E.
Kirundu.—1° 15′ S., 25° 30′ E.
Kisantu.—5° 10′ S., 15° 10′ E.
Kisumu.—0° 5′ S., 34° 45′ E.
*Kitagueta.—Uganda. Probably misspelling for Kitagwenda.
Kitagwenda.—0° 10′ N., 30° 45′ E.
Kitempuka.—5° 25′ S., 28° 45′ E.
Kitobola.—5° 20′ S., 14° 40′ E.
Kitta.—5° 55′ N., 0° 55′ E.
Kitui.—1° 15′ S., 38° E.
Kivu (L.).—2° S., 29° E.
Knysna.—34° S., 23° 5′ E.
Koloka, near Angu.—3° 5′ N., 24° 35′ E.
Konakry.—9° 25′ N., 13° 45′ W.
Kondué.—4° 55′ S., 23° 15′ E.
Kooa.—24° 50′ S., 24° 25′ E.
Kor Attar.—9° 55′ to 10° 25′ N., 32° 15′ to 34° E.
Kordofan.—12° 25′ N., 31° 15′ E.
Kor Gasch.—15° 5′ to 17° N., 35° to 36° 25′ E.
*Kor Guillo.—Homran, Anglo-Egyptian Sudan.
Kor Langhebb.—17° 25′ N., 37° E.
Kor Lebka.—16° 5′ to 16° 20′ N., 38° 30′ to 39° 15′ E.
Korogwe.—5° 10′ S., 38° 30′ E.
*Kortright Hill.—Sierra Leone.
Kotonou.—6° 20′ N., 2° 25′ E.
Kouandé.—10° 20′ N., 1° 45′ E.
Kounhi.—9° 15′ N., 41° 5′ E.
Krebedje.—5° 55′ N., 19° E.
Kribi.—3° N., 10° E.
Kroonstad.—27° 40′ S., 27° 20′ E.
Kubub.—26° 45′ S., 16° 15′ E.
Kuilu (R.).—3° 30′ to 4° 30′ S., 11° 45′ to 12° 30′ E.
Kulumuzi (R.).—5° 5′ S., 38° 50′ to 39° 5′ E.
Kunga, near Malela.—5° 55′ S., 12° 35′ E.
Kwamouth.—3° 20′ S., 16° 10′ E.
Kwango (R.).—3° to 10° S., 17° to 19° E.
Kwesi.—1° 5′ N., 30° E.
Kwidjwi (I.), Lake Kivu.—2° 10′ S., 29° 20′ E.
*Kyaka Fort.—On Kagera R., German East Africa.

Ladismith.—33° 30′ S., 21° 20′ E.
Lado.—5° 5′ N., 31° 45′ E.
Ladysmith.—28° 30′ S., 29° 45′ E.
Laffarugh.—10° 5′ N., 44° 50′ E.
Lagos.—6° 30′ N., 3° 25′ E.
Lambarene.—0° 40′ S., 10° 15′ E.
Lamu (I.).—2° 15′ S., 40° 55′ E.
Landana.—5° 15′ S., 12° 15′ E.
Landjoro.—3° 25′ S., 37° 50′ E.
Langenburg.—9° 35′ S., 34° 10′ E.
*Las Ej.—Somaliland.
*Leboi.—Abyssinia.
Lehututu.—23° 55′ S., 21° 55′ E.
Leitokitok.—2° 55′ S., 37° 45′ E.
Lemba (R.), Mayombe.—5° 20′ to 5° 40′ S., 12° 30′ to 12° 45′ E.
Leopold II (L.).—2° S., 18° 15′ E.
Leopoldville.—4° 25′ S., 15° 20′ E.
Leribe.—28° 45′ S., 28° 15′ E.
Lesse.—0° 40′ N., 29° 40′ E.
Lessouto, see Basutoland.
Letlake.—23° 40′ S., 22° 20′ E.
Let Marefia.—9° 45′ N., 40° E.
Lettema (Mt.).—3° 40′ S., 37° 20′ E.
*Lewa Mambaa.—German East Africa.
Libenge.—3° 35′ N., 18° 30′ E.
Libreville.—0° 25′ N., 9° 25′ E.
Lie.—2° N., 21° 20′ E.
Lifungula, Uele.—3° 45′ N., 27° 20′ E.
Likimi.—2° 40′ N., 20° 40′ E.
Likoni.—4° 5′ S., 39° 40′ E.
Limba.—9° 25′ N., 12° W.
Lindi.—10° S., 39° 45′ E.
Lindi (R.).—1° 25′ N., to 0° 25′ S., 25° 5′ to 29° E.
Lingunda.—1° N., 20° 40′ E.
*Linkanda.—Kasai, Belgian Congo.
Lisala.—2° 10′ N., 21° 30′ E.

Lisasa.—0° 15′ N., 29° 30′ E.
Livingstone.—18° S., 25° 45′ E.
Loango.—4° 35′ S., 11° 45′ E.
Loangwa (R.).—11° to 16° S., 30° to 33° E.
Lobatsi.—25° 10′ S., 25° 40′ E.
Lobay (R.).—4° 15′ S., 18° E.
*Lobombo Borges.—Portuguese East Africa.
Lokelenge.—1° 20′ N., 22° 45′ E.
Lokundje (R.).—3° 5′ to 3° 25′ N., 10° to 11° 15′ E.
Lolodorf.—3° 15′ N., 10° 40′ E.
Lomami (R.).—0° 45′ N. to 8° 45′ S., 24° to 26° E.
Lomie.—3° 10′ N., 13° 40′ E.
Lonely Mine.—19° 25′ S., 29° 25′ E.
*Longa.—Senegambia. Probably misspelling for Louga.
Longji.—3° 5′ N., 10° E.
Longonot Crater.—0° 55′ S., 36° 25′ E.
Lonkala.—4° 40′ S., 23° 10′ E.
Los (Is.).—9° 30′ N., 13° 50′ E.
Louga.—15° 35′ N., 16° 25′ W.
Lovoi (R.).—8° 10′ S., 26° 20′ E.
Luali.—5° S., 12° 25′ E.
Luapula (R.).—9° to 12° S., 29° E.
Lubi (R.).—5° to 6° 40′ S., 23° 20′ E.
Lubila.—1° N., 27° 10′ E.
Lubumbashi (R.).—11° 45′ S., 27° 40′ E.
Lubutu.—0° 40′ S., 26° 40′ E.
Lüderitz Bay.—26° 40′ S., 15° 10′ E.; same as Angra Pequena.
Lugh.—3° 50′ N., 42° 35′ E.
*Lugny.—French Congo.
Lugombe.—5° 40′ S., 28° 50′ E.
Lukaya (R.).—4° 30′ S., 15° 20′ E.
Luki.—5° 35′ S., 13° 10′ E.
Lukolela.—1° 10′ S., 17° 10′ E.
Lukonzolwa.—8° 50′ S., 28° 40′ E.
Lukuga (R.).—6° S., 27° to 29° E.
Lukula.—5° 25′ S., 13° E.
Lukungu (R.).—5° to 5° 30′ S., 14° 15′ to 14° 45′ E.
*Lumaliza.—Belgian Congo.
*Lumbulumbu.—Belgian Congo.
Lumbwa.—0° 40′ S., 35° 20′ E.
Lungube.—Katanga. Probably misspelling for Lugombe.
Lusambo.—4° 55′ S., 23° 15′ E.
Lusinga (I.), see Rusinga (I.).
Lydenburg.—25° 5′ S., 30° 25′ E.

Maddo Wells.—3° 55′ N., 41° E.
Madibi.—4° 25′ S., 18° 35′ E.
Madingu.—4° 10′ S., 13° 30′ E.
*Madona.—Nyamyas, Nyasaland.
Mafeking.—25° 50′ S., 25° 40′ E.
Mafia (I.).—7° 45′ S., 39° 30′ E.
*Mafungu.—Belgian Congo.
Magalapye.—23° 5′ S., 26° 55′ E.
Magala Re Umberto.—4° 45′ N., 41° 25′ E.
*Magnarra (R.).—Portuguese East Africa.
Maji-ya-chumvi.—3° 50′ S., 39° 25′ E.
*Majuba.—Herschel District, Cape Colony.
*Majuba Neck.—Cape Colony.
*Majunga.—Belgian Congo.
Makalla.—14° 30′ N., 49° 10′ E.
Makalle.—13° 30′ N., 39° 25′ E.
Makanga.—3° 40′ S., 25° 50′ E.
Makapan.—25° 15′ S., 28° 5′ E.
Makdischu.—2° N., 45° 30′ E.
Malange.—9° 35′ S., 16° 25′ E.
Malela.—6° S., 12° 40′ E.
Malema.—2° N., 21° 30′ E.
Malende.—4° 35′ N., 9° 30′ E.
*Malindi.—German East Africa.
Malindi (Southern Rhodesia).—19° S., 27° 10′ E.
*Malome.—On the Okiavo R., Belgian Congo.
Malvern.—29° 50′ S., 31° E.
Mamou.—10° 20′ N., 12° 15′ W.
Manamama.—2° N., 28° E.
Manda (I.).—2° 20′ S., 40° 55′ E.
Mandimbo.—0° 55′ S., 27° 20′ E.
*Mandouga.—French Congo.
Mandungu.—2° 30′ N., 23° 15′ E.
Mangapwani.—6° S., 39° 10′ E.
Mangbetu Country, see Niangara.
Mange.—4° S., 19° 30′ E.

*Maniou.—French Guinea. Probably Mamou.
Manow.—9° 15′ S., 33° 45′ E.
Marangu.—3° 20′ S., 37° 30′ E.
Masai Steppe.—1° S., 35° E.
Masaki.—1° 5′ S., 28° 10′ E.
Mascat.—23° 20′ N., 58° 40′ E.
Maseru.—29° 20′ S., 27° 25′ E.
Masisi.—1° S., 28° 30′ E.
Masongo.—1° S., 27° 35′ E.
Massaua.—15° 40′ N., 39° 25′ E.
Matadi.—5° 50′ S., 13° 35′ E.
Matagoi.—2° 30′ N., 43° 25′ E.
*Matchacha.—Between Ponthierville and Nyangwe, Belgian Congo.
Matetsi.—18° 15′ S., 26° 5′ E.
Matjesfontein.—33° 15′ S., 20° 35′ E.
Matoppo Hills.—20° 45′ S., 28° 50′ E.
Matroosberg.—33° 20′ S., 19° 40′ E.
Mau Escarpment.—0° to 1° S., 35° 30′ to 36° 20′ E.
*Maveli (Mts.).—Near the Munda R., French Congo.
Mawambi.—1° 10′ N., 28° 45′ E.
*Mayabal.—Eritrea.
Mayombe.—5° S., 13° E.
M'Bale.—1° 5′ N., 34° 10′ E.
Mbalmajo.—3° 30′ N., 11° 35′ E.
Mbamu.—4° 15′ S., 14° 45′ E.
Mbaramu.—4° 25′ S., 38° 20′ E.
*M'Bounion.—French Congo.
Mbusini.—6° 15′ S., 38° E.
Mbuyuni.—3° 30′ S., 37° 55′ E.
Medje.—2° 25′ N., 27° 30′ E.
*Melelia.—Eritrea.
Merca.—1° 45′ N., 44° 55′ E.
Meru (Mt.).—3° 15′ S., 36° 45′ E.
Metemma.—16° 45′ N., 33° 20′ E.
Metit.—3° 45′ N., 11° 35′ E.
*Mfongosi.—Zululand.
Mful Aja.—Near Metit, Cameroon.
*Mgaturo.—On Kwidjwi Island.
Mhonda.—6° 5′ S., 37° 35′ E.
Milmil.—8° 20′ N., 43° 50′ E.
*Mindouga.—French Congo.
Mindouli.—4° 15′ S., 14° 15′ E.
Misah öbe.—6° 55′ N., 0° 35′ E.
Mitiana.—0° 25′ N., 32° 5′ E.
*Mkosi.—Zululand.
Mobuku (R.).—0° 20′ N., 30° 15′ E.
Mobwasa.—2° 40′ N., 23° 5′ E.
Moera.—0° 35′ N., 29° 30′ E.
Moero (L.).—9° S., 29° E.
Mohasi (L.).—1° 50′ S., 30° 20′ E.
*Mokbe.—Near Dume, Cameroon.
*Mokundange.—Cameroon.
Moliwe.—4° 5′ N., 9° 15′ E.
Molo.—0° 15′ S., 35° 45′ E.
Molundu.—2° 5′ N., 15° 15′ E.
Mombasa.—4° S., 39° 50′ E.
Mombo.—4° 55′ S., 38° 15′ E.
Mondombe.—0° 35′ S., 22° 30′ E.
*Mondu (R.).—Southern Rhodesia.
Monga.—Near Amani, German East Africa.
Mongalla.—5° 10′ N., 31° 45′ E.
Mongumba.—3° 35′ N., 18° 30′ E.
Monrovia.—6° 30′ N., 10° 50′ W.
Montagu Pass.—33° 45′ S., 22° 30′ E.
*Moor Plantation. — Near Ibadan, Nigeria.
Morogoro.—6° 50′ S., 37° 50′ E.
*Morumballe (Mts.). — Zambesi R., Portuguese East Africa.
Moschi.—3° 20′ S., 37° 25′ E.
Mosekowa.—0° 45′ S., 26° 55′ E.
Mossamedes.—15° 15′ S., 12° 15′ E.
*Motombe.—Okiavo R., Belgian Congo.
*Mountain Rise.—Near Pietermaritzburg, Natal.
*Mowange.—Cameroon.
Mozambique (I.).—15° S., 40° 40′ E.
*M'Piaka.—French Congo.
M'Pila.—4° 10′ S., 15° 20′ E.
Mpongwe District.—0° 15′ N., 9° 20′ E. and 0° 40′ S., 9° 20′ E.
Mpororo.—0° 40′ to 1° 25′ S., 29° 20′ to 30° 30′ E.
Msozi.—0° 55′ S., 31° 50′ E.
*Mto-ya-Kifaru.—Arusha-chini, German East Africa.
Mubende Region.—1° 15′ N., 31° 15′ E.
Mubuku, eastern Ruwenzori Mt., see Mobuku.
Muculla.—7° S., 12° 50′ E.
Muemba.—4° 10′ S., 37° 50′ E.

Mukenge.—6° S., 22° 30′ E.
Mukonje (Farm).—4° 35′ N., 9° 30′ E.
Munda (R.).—0° 25′ N., 9° 35′ to 10° E.
Mundame.—4° 35′ N., 9° 35′ E.
Mungo (R.).—4° to 4° 50′ N., 9° 30′ E.
Munza.—3° 20′ N., 28° E.
Mussengue, see Sobato.
Mwatate.—3° 30′ S., 38° 20′ E.
Mwengwa.—13° S., 27° 40′ E.
Mwera (R.), Zanzibar.—6° 10′ S., 39° 15′ E.

Nabambisso (R.).—4° 45′ N., 28° 40′ E.
*Nabena.—Liberia.
Nahoon (R.).—32° 55′ S., 27° 50′ E.
Nairobi.—1° 5′ S., 36° 50′ E.
Naivasha.—0° 40′ S., 36° 35′ E.
Nakitawa.—0° 25′ N., 30° E.
Nakuru.—0° 15′ S., 36° 10′ E.
Nala.—2° 50′ N., 27° 50′ E.
Namaland, Little.—28° 45′ to 30° 15′ S., 16° 45′ to 19° E.
Nanga (Mts.).—4° 5′ N., 13° 5′ E.
Nana (R.).—6° 35′ N., 19° E.
Naremuru (R.).—0° 10′ S., 37° 15′ E.
Natron Lakes, foot of Mt. Kilimanjaro.—3° 10′ S., 36° 55′ E.
N'daika.—0° 10′ S., 37° 10′ E.
Ndara.—3° 30′ S., 38° 30′ E.
Ndjoro.—0° 20′ S., 36° E.
*N'Douna.—French Congo.
Nduye.—1° 20′ N., 28° 30′ E.
Nefasit.—15° 25′ N., 39° E.
Newcastle.—27° 45′ S., 29° 50′ E.
New Hanover.—29° 20′ S., 30° 35′ E.
New Moschi.—3° 20′ S., 37° 20′ E.
Ngamba (I).—0° 5′ S., 32° 40′ E.
Ngami (L.).—20° 50′ S., 23° E.
Ngare-na-Nyuki (R.), Mt. Meru.—3° to 3° 15′ S., 36° 55′ E.
Ngaré Nyuki (R.), Mt. Kenia.—0° 30′ N. to 0° 10′ S., 37° to 37° 25′ E.
Ngare Rongai.—2° 50′ S., 37° 30′ E.
Ngayu.—1° 40′ N., 27° 40′ E.
Ngazi.—0° 55′ N., 24° 50′ E.
Nguelo.—5° 5′ S., 38° 40′ E.
Ngumba Country.—3° 15′ N., 10° 53′ E.
Niam Niam Country.—4° 30′ to 7° N., 27° 30′ to 29° 30′ E.
Niangara.—3° 40′ N., 27° 50′ E.
Niapu.—2° 15′ N., 26° 50′ E.
Niembo, see Pale.
Nieuwdorp.—12° 5′ S., 27° 50′ E.
Njussi.—5° 12′ S., 38° 35′ E.
Nkolebunde.—3° 5′ N., 10° 35′ E.
Nkolentanga.—1° 50′ N., 10° 50′ E.
No (L.).—9° 30′ N., 30° 35′ E.
Nord Hook.—34° 5′ S., 18° 20′ E.
Nouvelle Anvers.—1° 40′ N., 19° 10′ E.
Nssanakang.—5° 50′ N., 8° 55′ E.
Nun (R.).—4° 20′ N., 6° 5′ E.
Nyamandhloru.—19° 55′ S., 28° 5′ E.
*Nyamyas.—Nyasaland.
Nyangnori.—0°., 35° E.
Nyangwe.—4° 15′ S., 26° 15′ E.
*Nyanza (L.).—Katanga, Belgian Congo.
Nyere, see Nyeri.
Nyeri.—0° 30′ S., 37° E.
Nyiro (Mt.).—2° 40′ N., 36° 25′ E.

Oban.—5° 20′ N., 8° 35′ E.
Obbia.—5° 20′ N., 48° 25′ E.
Obock,—12° N., 43° 15′ E.
Ogaden.—7° 10′ N., 44° 15′ E.
Ogowe (R.).—1° S., 10° E.
Okahandja.—22° S., 16° 55′ E.
Okiavo (R.), same as Lindi (R.).
Old Calabar.—5° N., 8° E.
Old Kasongo.—4° 30′ S., 26° 35′ E.
Olokemeji.—7° 25′ N., 3° 30′ E.
*Olombo.—Belgian Congo.
Omaheke.—21° to 21° 30′ S., 17° 30′ to 20° E.
Omdurman.—15° 50′ N., 32° 5′ E.
Ondoa.—2° 55′ N., 10° 15′ E.
Oni Camp.—6° 35′ N., 4° 15′ E.
*Ontys.—Ex-German Southwest Africa.
Oso (R.).—1° S., 27° 20′ E.
Ossidinge.—5° 45′ N., 9° 15′ E.
Ouossou.—6° 20′ N., 4° 55′ W.

*Paku.—Uele, Belgian Congo.
Pale (Niembo).—1° S., 27° 25′ E.
Panga.—1° 45′ N., 26° 15′ E.
Pangani.—5° 25′ S., 39° E.

Park Rynie.—30° 20′ S., 30° 45′ E.
*Patalonga.—Near Yambuya, Belgian Congo.
Patta (I.).—2° 5′ S., 41° 5′ E.
Pawa.—2° 25′ N., 27° 50′ E.
Pemba (I.).—4° 50′ to 5° 30′ S., 39° 40′ to 39° 50′ E.
Penge.—1° 25′ N., 28° 15′ E.
Pietermaritzburg.—29° 35′ S., 30° 25′ E.
Pinetown.—29° 45′ S., 30° 50′ E.
Pirie Forest.—32° 45′ S., 27° 15′ E.
Plumtree.—20° 30′ S., 27° 35′ E.
Poko.—3° 10′ N., 26° 50′ E.
Ponthierville.—0° 25′ S., 25° 30′ E.
Popokabaka.—5° 40′ S., 17° E.
Pori.—3° 35′ S., 38° 10′ E.
Port Alfred.—33° 35′ S., 26° 55′ E.
Port Elizabeth.—34° S., 25° 35′ E.
Port Florence.—0° 5′ S., 34° 45′ E.
Port Natal, see Durban.
Port Nolloth.—29° 15′ S., 16° 55′ E.
Port Sudan.—19° 35′ N., 37° 5′ E.
Possession (I.).—27° S., 15° 10′ E.
Pretoria.—25° 40′ S., 28° 15′ E.
Prince of Wales Bay.—27° 5′ S., 15° 15′ E.
Pungwe Valley.—18° 45′ to 19° 50′ S., 33° to 34° 55′ E.

*Quibanga.—Golungo Alto, Portuguese West Africa.
Quifangondo.—8° 45′ S., 13° 20′ E.
Quilimane.—17° 45′ S., 37° E.

Ramisi (R.).—4° 20′ to 4° 30′ S., 39° 5′ to 39° 25′ E.
Ras Doumeira.—12° 40′ N., 43° 5′ E.
Ras Fartak.—15° 50′ N., 52° 30′ E.
Ras Shoab.—12° 35′ N., 54° E.
Rau (R.).—3° 10′ to 3° 35′ S., 37° 20′ to 37° 25′ E.
*Redbank.—Rhodesia.
Reddersburg.—29° 35′ S., 26° 10′ E.
Redjaf.—4° 45′ N., 31° 35′ E.
Rendile.—2° 20′ N., 38° E.
Renk.—11° 45′ N., 32° 45′ E.
Revoue (R.).—18° 50′ to 19° 50′ S., 32° 40′ to 33° 50′ E.
Richmond.—29° 50′ S., 30° 15′ E.
Rikatla.—25° 45′ S., 32° 35′ E.
Rio Muni.—1° 40′ N., 10° E.
Risimu.—1° N., 26° 45′ E.
Romée.—0° 35′ N., 24′ 50′ E.
Rooibank.—23° 10′ S., 14° 40′ E.
Rosako.—6° 25′ S., 38° 40′ E.
Ruanda.—2° S., 29° 50′ E.
Rudolf (L.).—2° 20′ to 5° N., 36° E.
Rungu.—3° N., 28° E.
Rurunga.—0° 40′ S., 37° 5′ E.
Rusinga (I.).—0° 25′ S., 34° 10′ E.
Rutshuru.—1° 15′ S., 29° 30′ E.
Ruwenzori (Mt.).—0° 30′ N., 29° 50′ E.

Saati.—15° 35′ N., 39° 15′ E.
Sabderat.—15° 30′ N., 36° 40′ E.
Sabuka.—4° 30′ S., 15° 10′ E.
Sachsenwald, see Daressalaam.
Saganeiti.—15° 5′ N., 39° 10′ E.
St. Gabriel, near Stanleyville.
Saint Louis.—16° N., 16° 35′ W.
St. Paul de Loanda.—8° 55′ S., 13° 10′ E.
Saldanha Bay.—33° S., 18° E.
Salem.—22° 40′ S., 15° 25′ E.
Salisbury.—17° 45′ S., 31° E.
*Salmoreto.—Somaliland.
Salole.—4° 15′ N., 39° 25′ E.
Samburu.—3° 40′ S., 38° 55′ E.
Same.—4° 5′ S., 37° 45′ E.
Samkita.—0° 25′ S., 10° 25′ E.
*Samlia Falls.—On the N'Gamie R., Sierra Leone?
Sampwe.—9° 30′ S., 27° 25′ E.
San Antonio.—6° 10′ S., 12° 20′ E.
Sancurar.—4° N., 40° E.
Sanda, Lower Congo.—4° 35′ S., 15° 35′ E.
*Sanda.—Uganda.
Sankisia.—9° 30′ S., 25° 55′ E.
Sankuru (R.).—4° to 10° S., 21° to 22° E.
San Pedro.—4° 45′ N., 6° 40′ W.
Santa Isabel.—3° 45′ N., 8° 45′ E.
San Thomé (I.).—0° 20′ N., 6° 43′ E.
*Sawmills. — Umgusa R., Southern Rhodesia.

Schoa.—10° N., 39° 30′ E.
Seiotel.—15° 35′ N., 38° 20′ E.
Sebakwe.—19° 10′ S., 30° E.
Sekgoma.—24° 30′ S., 23° 50′ E.
Sele (R.).—4° 20′ to 5° 40′ S., 15° 35′ to 15° 55′ E.
Semliki (R.).—0° to 1° N., 29° 30′ to 30° E.
*Senge (Mts.).—Cameroon.
Sennar.—13° 30′ N., 33° 35′ E.
Serengeti, British East Africa.—3° 15′ S., 38° 10′ E.
Serui (R.).—22° 20′ S., 26° 45′ to 28° E.
Sette-Cama.—2° 30′ S., 9° 45′ E.
Settit (R.).—14° 20′ N., 35° 50′ to 37° 20′ E.
Severelela.—24° 55′ S., 24° 55′ E.
*Shanks Station.—Cape Colony.
Sherbro (I.).—7° 25′ N., 12° 45′ W.
Shiloango (R.).—5° S., 12° to 13° E.
Shiloh.—19° 45′ S., 28° 40′ E.
Shilouvane.—24° 10′ S., 30° 15′ E.
Shimoni.—4° 35′ S., 39° 15′ E.
Shinsenda.—12° 25′ S., 28° E.
*Shivyre.—Natal.
Shoshong Road Station.—23° 35′ S., 26° 35′ E.
Sibange, Maveli Mts., near the Munda R.—0° 25′ N., 9° 35′ E.
Sibayi (L.).—27° 20′ S., 32° 45′ E.
Sikasso.—11° 15′ N., 5° 35′ W.
Simon's Town.—34° 10′ S., 18° 25′ E.
Sinadogo.—5° 30′ N., 46° 10′ E.
Sinai Peninsula.—28° to 30° N., 32° 30′ to 35° E.
*Sipapoma.—On the Umgusa R., Southern Rhodesia.
Sir Lowry Pass.—34° 10′ S., 18° 55′ E.
Sitaweza.—1° S., 27° 20′ E.
Smithwinkle Bay.—34° 15′ S., 18° 25′ E.
*Sobato de Mussengue.—Golungo Alto, Portuguese West Africa.
Sogodas.—14° 55′ N., 36° 50′ E.
Sokode Basan.—9° N., 1° 10′ E.
Somabula.—19° 35′ S., 30° 40′ E.
Songalong.—6° 25′ N., 11° 15′ E.
Soppo.—4° 10′ N., 9° 15′ E.
*Springvale.—Rhodesia.
*Stamford Hill.—Near Durban, Natal.
Stanleyville.—0° 30′ N., 25° 15′ E.
*Steckstown.—Cape Colony.
Steinkopf.—29° 15′ S., 17° 45′ E.
*Stella Bush.—Durban, Natal.
Stellenbosch.—33° 55′ S., 18° 50′ E.
Stephanie (L.).—4° 40′ N., 36° 50′ E.
Steynsburg.—31° 20′ S., 25° 50′ E.
Stormberg Junction.—31° 20′ S., 26° 20′ E.
Stormsvlei.—34° 5′ S., 20° 5′ E.
Suakin.—19° 10′ N., 37° 22′ E.
Sunday River Mts., near Port Elizabeth.—33° 40′ S., 25° 45′ E.
*Sweetwaters.—Near Pietermaritzburg, Natal.
Swellendam.—34° 5′ S., 20° 30′ E.
*Sydenham.—Durban, Natal.

Table (Mt.).—34° S., 18° 25′ E.
Tabora.—5° 10′ S., 32° 50′ E.
Talavanje.—5° 40′ S., 12° 35′ E.
*Tanda.—Usambara, German East Africa.
Tanga.—5° 5′ S., 39° 5′ E.
Tanganyika (L.).—3° to 9° S., 29° to 31° E.
Taufikia.—9° 25′ N., 31° 45′ E.
Taveta.—3° 25′ S., 37° 45′ E.
Tchafianani.—8° 40′ N., 40° 25′ E.
Tchercher (L.).—8° 50′ N., 40° 35′ E.
Techeckna.—11° 25′ N., 16° 10′ E.
Teneriffe.—28° 35′ to 28° 5′ N., 23° 20′ to 24° 20′ E.
*Terwidja.—Northeast Africa.
Tes.—13° 35′ N., 44° E.
Tete, Belgian Congo.—1° 20′ N., 28° 50′ E.
Tete, Portuguese East Africa.—16° 10′ S., 33° 30′ E.
The Bluff, Durban.—29° 55′ S., 31° 5′ E.
Thiès.—14° 45′ N., 16° 15′ W.
Thopane.—24° 45′ S., 24° 15′ E.
Thysville.—5° 30′ S., 15° E.
Tibati.—6° 35′ N., 12° 35′ E.
Tiko.—4° 5′ N., 9° 25′ E.
Tiwi.—4° 5′ S., 39° 35′ E.

Toro, same as Fort Portal.
*Toukola.—Sudan.
Toullo.—9° 20′ N., 41° 10′ E.
Tsana (L.).—12° N., 37° 40′ E.
Tsavo.—3° S., 38° 25′ E.
*Tsessebe Station.—Rhodesia.
Tshoa.—5° 35′ S., 12° 45′ E.
Tshopo (R.).—0° 55′ N. to 0° 5′ S., 25° 5′ to 28° E.
Tua.—3° 30′ S., 16° 40′ E.
Tulbagh.—33° 20′ S., 19° E.
Tumba.—5° 25′ S., 14° 35′ E.

Ubangi (R.).—0° to 5° N., 18° to 23° E.
Uchibango.—0° 40′ S., 26° 20′ E.
Uebi, see Webi.
Uele (R.).—3° 30′ N., 23° to 30° E.
Uelleburg.—1° 45′ N., 10° 35′ E.
Ufumbiro (Mts.).—1° 15′ S., 29° 30′ E.
*Ugono (Mt.).—German East Africa.
Uitenhage.—33° 45′ S., 25° 25′ E.
Ulenge (I.).—5° 1′ S., 39° 10′ E.
Uluguru (Mts.).—7° 5′ S., 37° 40′ E.
Umangi.—2° 10′ N., 21° 25′ E.
*Umbilo.—Near Durban, Natal.
Umfolosi.—28° 25′ S., 32° 15′ E.
Umgeni (R.).—29° 25′ to 29° 50′ S., 29° 50′ to 31° E.
Umgusa (R.).—19° 25′ to 20° 5′ S., 27° 35′ to 28° 25′ E.
Unyoro Province.—1° 50′ N., 31° 35′ E.
*Uomber.—Abyssinia.
Uorandi.—5° 45′ N., 47° 15′ E.
Usambara.—5° 50′ S., 38° 40′ E.
*Usegua.—6° S., 38° E.
*Uzaga.—Region of the Great Lakes, Belgian Congo.

Valdezia.—23° 10′ S., 30° 15′ E.
Vankerckhovenville.—3° 20′ N., 29° 20′ E.
Van Reenen Pass.—28° 25′ S., 29° 30′ E.
Verulam.—29° 35′ S., 31° E.
Victoria.—4° N., 9° 15′ E.
Victoria Falls.—18° S., 25° 50′ E.
Vivi.—5° 45′ S., 13° 35′ E.
Voi.—3° 30′ S., 38° 30′ E.
Vrijburg.—26° 55′ S., 24° 35′ E.

Waboniland.—2° 10′ S., 40° 50′ E.
Wadi Halfa.—21° 55′ N., 31° 25′ E.
Waki (R.).—1° 30′ to 1° 50′ N., 31° 25′ E.
Walfish Bay.—22° 55′ S., 14° 30′ E.
Walikale.—1° 25′ S., 28° E.
Wambugu.—0° 40′ S., 37° 5′ E.
Wanga.—4° 40′ S., 39° 15′ E.
Wari, Forcados R.—5° 30′ N., 5° 45′ E.
Waterval Onder.—25° 40′ S., 30° 25′ E.
*Watikaia.—Belgian Congo.
Webi (R.).—4° 10′ to 7° 15′ N., 39° 35′ to 42° E.
Weenen District.—28° 50′ S., 30° 5′ E.
Welgelegen, Katanga.—12° S., 27° 45′ E.
Weranjanje.—1° 40′ S., 31° E.
*Wessels Neck.—Natal.
*Willbrook.—Near Ladysmith, Natal.
Willowmore.—33° 20′ S., 23° 30′ E.
Windhoek.—22° 35′ S., 17° 10′ E.
Winnebah.—5° 25′ N., 0° 40′ W.
Wombali.—3° 20′ S., 17° 10′ E.

*Xalosi.—Portuguese East Africa.
*Xoce (R.).—Southern Rhodesia.

Yabena Mabote.—1° 15′ S., 24° 40′ E.
Yakuluku.—4° 20′ N., 28° 50′ E.
Yakusu.—0° 35′ N., 25° E.
*Yalutcha.—Belgian Congo.
Yambata.—2° 20′ N., 22° 5′ E.
Yambinga.—2° 5′ N., 22° 35′ E.
Yambuya.—1° 20′ N., 24° 50′ E.
Yandumba.—0° 55′ N., 23° 20′ E.
Yanga.—5° 15′ S., 13° 40′ E.
*Yangandi.—Belgian Congo.
Yanonge.—0° 40′ N., 24° 30′ E.
Yaunde.—3° 50′ N., 11° 35′ E.
Yukaduma.—3° 25′ N., 15° E.
Yumbi.—1° 50′ S., 16° 40′ E.

Zambesi (R.).—11° 5′ to 18° 45′ S., 22° 35′ to 36° 15′ E.
Zambi.—6° S., 12° 50′ E.
Zanzibar (I.).—6° S., 39° 30′ E.
Zomba.—15° 20′ S., 35° 20′ E.
Zoutpansberg.—23° 20′ S., 30° 30′ E.
Zyoual (Mt.).—8° 35′ N., 38° 55′ E.

FORMICIDÆ

DORYLINÆ Leach

Dorylini Forel

Dorylus FABRICIUS

Dorylus Fabricius, 1793, 'Ent. Syst.,' II, p. 365. Shuckard, 1840, Ann. Nat. Hist., V, p. 268. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 697; 1910, 'Gen. Insect., Dorylinæ,' p. 5.

Typhlopone Westwood, 1840, 'Introd. Class. Insects,' II, p. 219. Shuckard, 1840, Ann. Nat. Hist., V, p. 262. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 110.

Dichthadia Gerstæcker, 1863, Stettin. Ent. Zeitg., XXIV, p. 85.

Alaopone Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 274.

Vespa Linnæus. *Mutilla* Linnæus, Lamarck.

Genotype: *Vespa helvola* Linnæus, 1764.

Subgenus 1. **Dorylus** FABRICIUS, *sensu stricto*

Dorylus subg. *Dorylus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 701 and 714; 1910, 'Gen. Insect., Dorylinæ,' p. 9.

Subgenotype: same as genotype.

1. **Dorylus affinis** Shuckard, 1840, Ann. Nat. Hist., V, p. 316 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 79 (♂). F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 2, Pl. I, fig. 6. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 357 (♂). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 110 (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 9. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200 (♂). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂). Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 719, figs. H, J. (♂); 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 596, fig. (♂). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 42. Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 499 (♂); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416, 417, 421, 428, and 429 (☿, larva, pupa), Pl. I, figs. 1–8, 10–11; Pl. II, figs. 1–9. Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 47 (♂). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387; 1907, in Sjöstedt, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 8 (♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, p. 352 (1909), (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 212 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, pp. 737 and 744, fig. 1*d* (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 9 (♂, ☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 375 (♂). Forel, 1911, Rev. Zool. Afr., I, p. 274 (☿, ♂). Silvestri, 1913, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 145; 'Report Exped. to Africa in Search Nat. Enem. Fruit Flies,' 1914, p. 128. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 58 (☿, ♂); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 120 (♃, ☿, ♂), Pl. IV, fig. 35. Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 18 (♂).

Dorylus planiceps Haldeman, 1849, Proc. Acad. Nat. Sci. Philadelphia, IV, p. 204 (♂).

Typhlopone oraniensis var. *brevinodosa* Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 737 (☿); 1863, ibid., XIII, p. 457.

Typhlopone brevinodosa Roger, 1863, 'Verzeich. Formicid.,' p. 20.

Dorylus brevinodosus Emery, 1887, Bull. Soc. Ent. Italiana, XIX, p. 349. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (☿). Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 707 and 717, figs. F*1-3* (☿); 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 596 (☿). Zavattari, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 550, p. 2 (☿).

Type locality: Gambia River, Gambia.

Senegambia: Dakar (F. Silvestri). Portuguese Guinea: Bambaya (Lucas). French Guinea: Konakry; Camayenne (F. Silvestri). Liberia: Cape Palmas (Savage). Gold Coast: Kitta; Akra (H. Brauns). Cameroon: (Conradt). Fernando Po: (Conradt). French Congo: Gaboon (Dinklage); Ogowe (Mocquerys); Brazzaville (A. Weiss); southern Darbanda, Krebedje; Cape Lopez. Belgian Congo: Leopoldville (de Pauw); Kitobola (Rovere). Portuguese Congo: Landana. Northern Rhodesia: Kazungula (Jallá). German East Africa: Amani (H. Prell); Kibonoto, Kilimanjaro (Sjöstedt); Lake Galago in northern Ruanda (Schubotz). Zanzibar: (Stuhlmann). British East Africa: Mombasa (v. d. Decken; C. Alluaud); Kavirondo Bay, Victoria Nyanza; Mau Escarpment between El Burgon and Ndjoro, 2100 m. (Alluaud and Jeannel). Uganda: Unyoro Province near Hoima; east of Lake Albert; M'Bale (C. Alluaud); Ibanda; Kaibo (Duke of Abruzzi); Gondokoro (F. Werner). Somaliland: Errer-es-Saghir (Bricchetti-Robecchi). Abyssinia: Budito to Dimé (V. Bottego); Webi; Magala Re Umberto; Ogaden; Ganale (Ruspoli); Anglo-Egyptian Sudan: Kor Attar south of Fashoda (F. Werner); Blue Nile (C. Alluaud).

1_1. Var. **ægyptiacus** (Mayr) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 720 (♂); 1896, Ann. Mus. Civ. Genova, XXXVII, p. 153 (♂); 1897, ibid., XXXVIII, p. 596, fig. (♂). Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid., p. 1 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 744 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 248 (☿, ♂). Karawaiew, 1911, Rev. Russe Ent., XI, p. 3 (♂). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, pp. 3 and 5 (☿, ♂). Wasmann, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, p. 109; 1917, Zeitschr. Wiss. Zool., CXVII, p. 309.

Dorylus ægyptiacus Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 76, footnote (♂). Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 255 (♂). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (♂); 1884, Ann. Mus. Civ. Genova, XXI, p. 538 (♂). Emery, 1892, Ann. Soc. Ent. France, XLI, Bull., p. liv.

Dorylus affinis subsp. *ægyptiacus* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 19 (♂).

Dorylus affinis var. *abyssinicus* Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, p. 424 (☿), Pl. i, fig. 9; 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿).

Typhlopone brevinodosa Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 381, fig. (☿); 1881, ibid., XVI, p. 271 (☿).

Dorylus brevinodosus Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 78.

Dorylus brevinodosus var. *abyssinicus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 717 (☿).

Type locality: Egypt.

Eritrea: Nefasit (K. Escherich; F. Silvestri); Keren (Beccari; F. Silvestri); Ghinda (F. Silvestri); Aikota (Magretti). Anglo-Egyptian Sudan: Sennar (C. Alluaud); Kawa, White Nile (I. Trägårdh); Khartum (Karawaiew); El Hefera on Settit; Kor Guillo, Homran (Magretti). British East Africa: Maddo Wells (V. Bottego). Abyssinia: Let Marefia, Schoa (Antinori); Salole (Ruspoli); southern Abyssinia (Ilg).

1_2. Var. **exilis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 59 (♂); 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 18 (♂).

Dorylus affinis subsp. *löwyi* var. *exilis* Santschi, 1910, Rev. Suisse Zool., XVIII, p. 744 (♂).

Type locality: Kibosho, Mt. Kilimanjaro, German East Africa (C. Alluaud).

German East Africa: New Moschi, 800 m.; Himo River, 1000 m.; Kilema, 1400 m. (Alluaud and Jeannel). British East Africa: Nairobi; Rurunga, Kikuyu; Bura, Wa-Taita; Taveta; Mombasa; Ngaré Nyuki, Kenia (Alluaud and Jeannel).

1_3. Var. **hirsutus** (Santschi).

Dorylus affinis subsp. *ægyptiacus* var. *hirsuta* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, pp. 19 and 20 (♂).

Type locality: Abyssinia (Reichensperger).

1_4. Var. **parapsidalis** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, pp. 19 and 20 (♂).

Type locality: Blantyre, Nyasaland (G. Arnold).

1_5. Var. **pulliceps** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, pp. 18 and 19 (♂).

Type locality: Ivory Coast (Lohier).

1_6. Var. **sudanicus** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, pp. 18 and 19 (♂).

Type locality: Fort Sibut, southern Darbanda, French Congo (Decorse).

1*a*. Subsp. **denudatus** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 19 (♂).

Dorylus denudatus Santschi, 1910, Rev. Suisse Zool., XVIII, pp. 737 and 742, figs. 1a and 4 (♂).

Type locality: Upper Niger (Claveau).

1*b*. Subsp. **löwyi** Forel, 1907, Ann. Soc. Ent. Belgique, LI, p. 292 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 744 (♂). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 254 (♂).

Dorylus affinis subsp. *löwyi* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 60 (♂).

Dorylus affinis subsp. *löwyi* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, pp. 19 and 20 (♂).

Type locality: Zanzibar (Löwy).

Eritrea. British East Africa: Mombasa; Athi Plain (Feringue); Rurunga, Kikuyu; Wambogo; Nairobi, Masai Plain (Alluaud and Jeannel). Rhodesia: Bulawayo (G. Arnold).

2. **Dorylus alluaudi** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 60, fig. 4 (♂).

Type locality: Eastern slopes of Mt. Ruwenzori, 1600 m., UGANDA (C. Alluaud).

3. **Dorylus atratus** F. SMITH, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 4 (♂), Pl. I, fig. 15. ROGER, 1863, 'Verzeich. Formicid.,' p. 41. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 10. ERN. ANDRÉ, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂). EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 722 (♂). W. A. SCHULZ, 1906, 'Spolia Hymenopterologica,' p. 297 (♂). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 127 (♂). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 374 (♂). See p. 43.

Type locality: Old Calabar, NIGERIA.

FERNANDO PO: (Conradt); Santa Isabel (Schultze). CAMEROON: Bibundi (Tessmann). FRENCH CONGO: Ogowe (Mocquerys). BELGIAN CONGO: Stanleyville (Lang and Chapin).

4. **Dorylus bequaerti** FOREL, 1913, Rev. Zool. Afr., II, p. 311 (☿). BEQUAERT, ibid., p. 423. See p. 43.

Type locality: Sankisia, BELGIAN CONGO (J. Bequaert).

BELGIAN CONGO: Pasaconde near Zambi (J. Bequaert); Banana (Lang and Chapin).

5. **Dorylus braunsi** EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707 and 718, fig. G (☿); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416 and 428 (☿). SANTSCHI 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 120 (☿, ♂).

Type locality: LIBERIA (H. Brauns).

FRENCH CONGO: Mandouga; Mbamu (A. Weiss). RHODESIA: Bulawayo (G. Arnold).

5a. Subsp. **anceps** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 215 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

6. **Dorylus brevipennis** EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 721, figs. K and L (♂); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 424 and 428 (☿), Pl. I, fig. 12. MAYR, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. ZAVATTARI, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 550, p. 2 (♂). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿, ♂). SANTSCHI, 1910, Rev. Suisse Zool., XVIII, p. 741 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 61 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 14 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 122 (☿, ♂).

Type locality: Tabora, GERMAN EAST AFRICA.

ZULULAND: Umfolosi (I. Trägårdh). NORTHERN RHODESIA: Kazungula (Jallá). BRITISH EAST AFRICA: Gilgil, Rift Valley, 1980 m. (Alluaud and Jeannel). UGANDA: Bujongolo Region (C. Alluaud). ANGLO-EGYPTIAN SUDAN: Mongalla opposite Lado (F. Werner).

6_1. Var. **marshalli** EMERY, 1901, Mem. Accad. Sc. Bologna, (5) IX, p. 425 (☿, ♂), Pl. I, fig. 13. SANTSCHI, 1910, Rev. Suisse Zool., XVIII, p. 741 (☿). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿, ♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 122 (☿, ♂). FOREL, 1916, Rev. Suisse Zool., XXIV, p. 402 (☿). See p. 43.

Type locality: Salisbury, SOUTHERN RHODESIA (H. Brauns).

MOZAMBIQUE: Valley of the Revoue (G. Vasse). BELGIAN CONGO: (Kohl); Medje (Lang and Chapin).

6a. Subsp. **zimmermanni** Santschi, 1910, Rev. Suisse Zool., XVIII, pp. 737 and 738, figs. 1*c* and 2*a-c* (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 123 (♃, ☿, ♂).

Type locality: Madingu, French Congo (P. Zimmermann).

Southern Rhodesia: Hillside, Bulawayo (G. Arnold).

6a$_1$. Var. **bulawayensis** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 364.

Dorylus affinis subsp. *zimmermanni* var. *bulawayensis* Forel, 1914, ibid., (5) L, p. 215 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

7. **Dorylus depilis** (Emery) Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 71 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 737, fig. 1*e* (♂). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 254 (☿); 1911, Rev. Zool. Afr., I, p. 274 (♂); 1913, ibid., II, p. 312 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (♂); 1913, Rev. Suisse Zool., XXI, p. 668 (♂). See p. 43.

Dorylus affinis var. *depilis* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 720 (♂). Mayr, 1896, Ent. Tidskr., XVII, p. 230 (♂).

Dorylus affinis subsp. *depilis* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♂); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (♂); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (♂). Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 19 (♂).

Type locality: Gold Coast.

West Africa: (Fülleborn). Togo. Cameroon: (Sjöstedt; Conradt). Nigeria: Old Calabar (Bates). Belgian Congo: Sankuru (Luja); Valley of the Lubumbashi (Buttgenbach); Kitobola (Rovere); Lukula (Daniel); Kabambare (Flamand); Kapiri (Leplae); Api (Laplume); Sankisia (J. Bequaert); Dima (A. Koller); Faradje; Medje; Stanleyville (Lang and Chapin). German East Africa: Amani (Zimmer). British East Africa: Nairobi (H. Prell). Uganda: (Benoit).

7$_1$. Var. **clarior** (Santschi).

Dorylus affinis subsp. *depilis* var. *clarior* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 246 (♂); 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 19 (♂).

Type locality: Zambézie (Durand).

Belgian Congo: Ubangi (Augustin). Fernando Po.

7$_2$. Var. **ugandensis** (Santschi).

Dorylus affinis var. *ugandensis* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 59 (♂).

Dorylus affinis subsp. *depilis* var. *ugandensis* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 19 (♂).

Type locality: Unyoro Province, east of Lake Albert, Uganda (C. Alluaud).

8. **Dorylus furcatus** (Gerstæcker) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 718 (♀); 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♀). Arnold, 1915, Ann. South African Mus., XIV, p. 124 (♀).

Dichthadia furcata Gerstæcker, 1872, Stettin. Ent. Zeitg., XXXIII, p. 257 (♀). Emery, 1887, Bull. Soc. Ent. Italiana, XIX, p. 350 (♀), Pl. xi, figs. 4 and 5.

Type locality: South Africa.

According to Arnold this is perhaps only an individual variation of *D. helvolus* ♀ or a variety of that species.

9. **Dorylus gaudens** Santschi, 1919, Rev. Zool. Afr., VI, p. 244 (♂).

Type locality: Boga, Belgian Congo (A. Pilette).

10. **Dorylus gribodoi** Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 570 (♂), Pl. xv, fig. 15; 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 723, fig. O (♂). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂). Forel, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 745 (♂); 1911, Ann. Soc. Ent. Belgique, LIV, p. 282 (♂). Forel, 1913, Rev. Zool. Afr., II, p. 312 (♂).

Type locality: Amu, Togo.

Liberia: (Kieselbach). Ivory Coast: (A. Richard; Lohier). Gold Coast. Nigeria: Lower Benue (Lenfant). French Congo: Ogowe (Mocquerys). Belgian Congo: Kondué (Luja).

10_1. Var. **confusus** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 246 (♂).

Type locality: Grand Bassam, Ivory Coast (Lohier).

Ivory Coast: near Imbokro (Posth).

11. **Dorylus helvolus** (Linnæus) Fabricius, 1793, 'Ent. Syst.,' II, p. 365 (♂). Coquebert, 1801, 'Illustr. Iconogr. Ins.,' II, p. 65 (♂), Pl. xvi, fig. 1. Latreille, 1802, 'Hist. Nat. Crust. Ins.,' III, p. 352 (♂). Fabricius, 1804, 'Syst. Piez.,' p. 427 (♂). Latreille, 1805, 'Hist. Nat. Crust. Ins.,' XIII, p. 260 (♂, in part). Jurine, 1807, 'Nouv. Méth. Class. Hym.,' p. 281 (♂). Latreille, 1809, 'Gen. Crust. Ins.,' IV, p. 124 (♂). Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 228 (♂). Blanchard, 1840, 'Hist. Nat. Ins.,' III, p. 378 (♂). Schuckard, 1840, Ann. Nat. Hist., V, p. 315 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 79 (♂). Fairmaire, in J. Thomson, 1858, 'Archives Entomologiques,' II, p. 263. F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 1, Pl. i, fig. 5. Duméril, 1860, Mém. Acad. Sc. Paris, XXXI, p. 901 (♂). Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Trimen, 1880, Trans. Ent. Soc. London, Proc., p. xxiv, fig. and p. xxxiii (♀); 1881, Trans. South African Phil. Soc., II, 1, Proc., p. xvii. Emery, 1887, Ann. Mus. Civ. Genova, XXV, p. 449, footnote (☿, ♂); 1887, Bull. Soc. Ent. Italiana, XIX, p. 349 (☿, ♀, ♂), Pl. xi, figs. 1–3 and 6–7. Distant, 1892, 'A Naturalist in the Transvaal,' p. 211. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 11. H. Stadelmann, 1893, Mitth. Deutsch. Schutzgeb., VI, p. 217. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 17 (☿); ibid., Bull. p. lxxiii, fig. (♀); 1895, Ann. Mus. Civ. Genova, XXXV, p. 177 (☿); 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707, 708, and 714, figs. C–E (☿, ♂). Wasmann, 1897, Deutsch. Ent. Zeitschr., p. 278; 1898, Wien. Ent. Zeitg., XVII, p. 103. H. Brauns, ibid., p. 226. Wasmann, 1899, Deutsch. Ent. Zeitschr., pp. 174 and 175; 1900, Zool. Jahrb. Abt. Syst., XIV, pp. 266, 268, and 274. Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416 and 428 (☿). H. Brauns, 1901, Zeitschr. f. Hym. u. Dipt., I, p. 16 (♂). Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 61. Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 676. Bingham, 1906, Trans. Ent. Soc. London, Proc., p. xxvi. Forel, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (♂). Mayr, 1907, in Sjöstedt, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 7 (☿). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 334 and 376 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿, ♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (☿, ♂); 1913, Rev. Zool. Afr., II, p. 311 (☿). Bequaert, ibid., p. 423. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd.,

III, p. 14 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 61 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿). H. SCHMITZ, 1914, Zool. Jahrb. Abt. Syst., XXXVII, pp. 522 and 559. LAMBORN, 1914, Trans. Ent. Soc. London, (1913), Proc., p. cxxiii. ARNOLD, 1915, Ann. South African Mus., XIV, p. 116 (♃, ☿, ♀, ♂), Pl. IV, figs. 33, 33*a*, 33*b*, 34, and 34*a*. WASMANN, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, p. 136; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 304 and 352.

Vespa helvola LINNÆUS, 1764, 'Mus. Ludov. Ulric.,' p. 412 (♂).

Mutilla helvola LINNÆUS, 1767, 'Syst. Nat.,' Ed. 12, I, 2, p. 967 (♂). PH. L. MÜLLER, in Linnæus, 1775, 'Vollst. Natursyst.,' V, p. 920 (♂). FABRICIUS, 1787, 'Mantissa Insect.,' I, p. 313 (♂). GMELIN, 1790, in Linnæus, 'Syst. Nat.,' Ed. 13, I, 5, p. 2807 (♂). CHRIST, 1791, 'Naturg. d. Insect.,' p. 151 (♂).

Mutilla dorylus LAMARCK, 1817, 'Hist. Nat. Anim. s. Vertèbr.,' IV, p. 101 (♂); 1835, ibid., 2e éd., IV, p. 316 (♂).

Mutilla (Dorylus) helvolus BLANCHARD, in Cuvier, 1849, 'Règne Animal,' Ed. 3, Insect., II, Pl. CXVIII, fig. 1 (♂).

Typhlopone punctata F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 112 (☿). ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 45; 1863, 'Verzeich. Formicid.,' p. 20. MAYR, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 74. W. F. KIRBY, 1884, Ann. Mag. Nat. Hist., (5) XIII, p. 406 (☿).

Typhlopone europæa ROGER, 1859, Berlin. Ent. Zeitschr., III, p. 248 (☿), Pl. VII, fig. 3. MAYR, 1861, 'Europ. Formicid.,' p. 53 (☿). ROGER, 1863, 'Verzeich. Formicid.,' p. 20. ERN. ANDRÉ, 1874, Rev. Mag. Zool., (3) II, p. 187 (☿). EMERY, 1876, Stettin. Ent. Zeitg., XXXVII, p. 72 (☿).

Typlopone europæa MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 457.

Typlopone punctata MAYR, ibid., p. 457.

Dorylus planifrons MAYR, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 74 (♂), Pl. III, fig. 21.

Dorylus punctatus ERN. ANDRÉ, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 251 (☿), Pl. XV, fig. 5.

Type locality: Cape of Good Hope.

TOGO: Bismarckburg (Buttner). SOUTHERN NIGERIA: Agege (Lamborn). BELGIAN CONGO: Elisabethville (J. Bequaert). SOUTHERN RHODESIA: common (G. Arnold). TRANSVAAL: Barberton (Rendall); Pretoria (Wichgraf; F. Silvestri; Distant); Makapan; Hebron (E. Simon). ORANGE FREE STATE: Kroonstad (H. Brauns); Bloemfontein (E. Simon). CAPE PROVINCE: Cape Town (E. Simon; Schonland; Wilms); Dunbrody; Blue Cliff (O'Neil); East London (Dixey and Longstaff); Port Elizabeth (H. Brauns). NATAL: (Kluckauf); Estcourt (I. Trägardh); Port Natal (Schultze); Durban (Wilms; Hahn); Ladysmith (Dixey and Longstaff). NYASALAND: Zomba; Fort Johnston (Rendall). GERMAN EAST AFRICA: Mombo, Usambara; Kibonoto, Mt. Kilimanjaro (Sjostedt). BRITISH EAST AFRICA: Kenia Region, between the Nyeri and Amboni Rivers, 1800 m. (Alluaud and Jeannel). ABYSSINIA: Arussi Galla, Ganale Gudda (V. Bottego).

11_1. Var. **impressus** STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 127 (♃, ☿).

Type locality: Alen, SPANISH GUINEA (Tessmann).

12. **Dorylus lobatus** SANTSCHI, 1919, Rev. Zool. Afr., VI, p. 244 (♂).

Type locality: Lukolela, BELGIAN CONGO (Christy).

BELGIAN CONGO: Kabinda (Schwetz).

13. **Dorylus mandibularis** Mayr, 1896, Ent. Tidskr., XVII, p. 228 (♂). Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 157, footnote. Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂).

Type locality: Cameroon (Sjöstedt).

13_1. Var. **pulchellus** Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 361 (♂).'

Type locality: Dimbroko, Ivory Coast (Le Moult).

14. **Dorylus mœstus** (Emery) Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 71 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 374 (♂). See p. 43.

Dorylus affinis var. *mæstus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 720 (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♂).

Type locality: Congo.

Belgian Congo: Sankuru (Luja); Lukula (Daniel); Stanleyville (Lang and Chapin); Kimuenza (Schultze).

14_1. Var. **claripennis** Santschi, 1919, Rev. Zool. Afr., VI, p. 243 (♂).

Type locality: Lower Kasai, Belgian Congo (Vanderyst).

14_2. Var. **morio** Santschi, 1919, Rev. Zool. Afr., VI, p. 243 (♂).

Dorylus mæstus Santschi, 1910, Rev. Suisse Zool., XVIII, pp. 737 and 741, figs. 1*b* and 3 (♂).

Type locality: Madingu, French Congo (Zimmermann).

14*a*. Subsp. **schereri** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 254 (♂).

Dorylus mæstus var. *schereri* Santschi, 1919, Rev. Zool. Afr., VI, p. 244 (♂).

Type locality: Liberia (Scherer).

Ivory Coast: Dimbroko.

15. **Dorylus politus** Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416, 426, and 428 (☿), Pl. i, figs. 14–17; 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (☿); 1913, Rev. Suisse Zool., XXI, p. 668 (☿).

Type locality: Cameroon (Conradt).

Belgian Congo: Mayombe (de Briey). Cameroon: Johann-Albrechtshöhe (Conradt).

16. **Dorylus spininodis** Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 426 and 428 (☿), Pl. i, figs. 18–21. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (☿). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 747 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 60 (☿).

Type locality: Cameroon (Conradt).

Cameroon: Victoria (F. Silvestri). Nigeria: Benin; Olokemeji (F. Silvestri). French Congo: Brazzaville (A. Weiss). Uganda: Toro Province near Fort Portal (C. Alluaud).

16*a*. Subsp. **longiceps** Viehmeyer, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 26, fig. 1 (☿).

Type locality: Manow, Langenburg, German East Africa.

17. **Dorylus stadelmanni** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 722, figs. N and M (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂).

Type locality: Congo.

Northeastern Africa: Terwidja (von Erlanger).

18. **Dorylus staudingeri** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 721 (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 10 (♂). See p. 43.

Type locality: Congo.

Belgian Congo: Medje (Lang and Chapin).

19. **Dorylus striatidens** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 745, fig. 5 (☿).

Type locality: Casamance (Claveau).

Senegambia: Dakar (Melou).

Subgenus 2. **Anomma** SHUCKARD

Anomma Shuckard, 1840, Ann. Nat. Hist., V, p. 326.

Dorylus subg. *Anomma* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 701 and 710; 1910, 'Gen. Insect., Dorylinæ,' p. 10.

Sphegomyrmex Imhoff, 1852, Verh. Naturf. Ges. Basel, X, p. 175.

Alaopone (part) Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 274.

Subgenotype: *Anomma burmeisteri* Shuckard, 1840 = *Dorylus nigricans* Illiger (1802) subsp. *burmeisteri* (Shuckard).

20. **Dorylus (Anomma) emeryi** Mayr, 1896, Ent. Tidskr., XVII, p. 225 (☿). Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 462; 1901, Mem. Accad. Sc. Bologna, (5) IX, p. 428 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 11 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 127 (☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 154, figs. A7 and B9 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 333 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 402 (☿).

Dorylus emeryi Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 157, footnote.

Type locality: Cameroon (Sjöstedt; Conradt).

Gold Coast: Aburi (F. Silvestri). Cameroon: Mundame (Conradt). Belgian Congo: (Kohl).

20_1. Var. **pulsi** Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 170 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 11 (☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 154 (☿).

Type locality: West Africa.

20*a*. Subsp. **opacus** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 58 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 11 (☿). Forel, 1911, Rev. Suisse Zool., XIX, p. 452 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (☿). See p. 43.

Dorylus (Anomma) opacus Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 154 and 157, figs. A8, B3, and *B10* (☿, ♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 402 (♂).

Dorylus (Anomma) emeryi var. *opaca* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 127 (♃, ☿).

Type locality: Lower Congo, in stomach of *Manis temmincki* (Solon).

Belgian Congo: (Kohl); Mayombe (de Briey); Medje; Ngayu (Lang and Chapin). Cameroon: Mundame (Conradt). Fernando Po: (Conradt). French Congo: Gaboon (F. Faure).

21. **Dorylus (Anomma) funereus** Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 11 (♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 402 (♂). See p. 44.

Dorylus (Anomma) nigricans var. *funereus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 708 and 712 (♂); 1899, Ann. Soc. Ent. Belgique, XLIII, p. 461. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 70 (♂); 1913, Rev. Zool. Afr., II, p. 311 (♂); 1913, Rev. Suisse Zool., XXI, p. 667 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (♂).

Type locality: Gold Coast.

Belgian Congo: Sankuru; Kondué (Luja); Lukula (Daniel); Medje; Stanleyville; Bolobo to Lukolela (Lang and Chapin). Cameroon: (Conradt).

22. **Dorylus (Anomma) gerstäckeri** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707 and 713 (☿), Pl. xvii, fig. 11.

Anomma gerstæckeri Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 462 (☿).

Dorylus (Anomma) gerstæckeri Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416, 427, and 428 (☿), Pl. i, fig. 22; 1910, 'Gen. Insect., Dorylinæ,' p. 11 (☿); Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿).

Dorylus (Anomma) gerstækeri Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 154 (☿).

Type locality: Akra, Gold Coast.

Gold Coast: Aburi (F. Silvestri). Cameroon: (Conradt).

22*a*. Subsp. **quadratus** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 430 (♃).

Type locality: Manow, German East Africa.

23. **Dorylus (Anomma) kohli** Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, pp. 669 and 675 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 11 (☿). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 254 (☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 154, fig. C*1* (☿). Wasmann, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, pp. 105 and 147; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 290 and 322. See p. 44.

Anomma kohli H. Schmitz, 1914, Zool. Jahrb. Abt. Syst., XXXVII, pp. 515 and 540, footnote; 1915, Deutsch. Ent. Zeitschr., p. 487. Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 204.

Type locality: Stanleyville, Belgian Congo (Kohl).

Nigeria: Old Calabar (Bates). French Congo: Brazzaville (A. Weiss). Belgian Congo: Akenge; Niangara; Avakubi (Lang and Chapin); St. Gabriel (Kohl).

23_1. Var. **chapini** Wm. M. Wheeler. See p. 45 (☿).

Type locality: Stanleyville, Belgian Congo (Lang and Chapin).

23_2. Var. **congolensis** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352, fig. 1 (☿); 1912, Ann. Soc. Ent. Belgique, LVI, pp. 154 and 158, figs. A*6*, B*11*, and C*2* (☿). See p. 45.

Type locality: Brazzaville, French Congo (A. Weiss).

French Congo: N'Douna (A. Weiss). Belgian Congo: Leopoldville (Lang and Chapin); Thysville (J. Bequaert).

23_3. Var. **frenisyi** Forel, 1916, Rev. Suisse Zool., XXIV, p. 402 (☿).

Type locality: Belgian Congo (Kohl).

23_4. Var. **langi** Wm. M. Wheeler. See p. 45 (☿).

Type locality: Malela, Belgian Congo (Lang and Chapin).

23_5. Var. **minor** Santschi, 1911, Rev. Zool. Afr., I, p. 206 (☿); 1912, Ann. Soc. Ent. Belgique, LVI, p. 155, figs. *A9* and *B8* (☿).

Type locality: Cucala, Benguela (J. Cruchet).

24. **Dorylus (Anomma) mayri** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 155 and 159, figs. *A10*, *B7* and *B13* (☿).

Type locality: Cameroon.

25. **Dorylus (Anomma) nigricans** Illiger. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 706, 708, and 710 (☿, ♂), Pl. xiv, figs. 1*a*–*g*. Mayr, 1896, Ent. Tidskr., XVII, p. 225 (☿, ♂). Emery, 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416 and 428 (☿). Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 47 (♂); 1907, ibid., XXIV, p. 15 (♂); 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (♂). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 248 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 12 (☿, ♂). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (♃, ☿, ♂); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 375 (♀). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (☿); 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 177, Pl., figs. 1, 3a, 4a, and 6–8 (☿, ♀). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 156 (☿). Forel, 1913, ibid., LVII, p. 348 (☿); 1913, Rev. Zool. Afr., II, p. 311 (♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 62 (♂). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 216 (♂).

Dorylus nigricans Illiger, 1802, Mag. f. Insectenk., I, p. 188 (♂). Fabricius, 1804, 'Syst. Piez.,' p. 427 (♂). Jurine, 1807, 'Nouv. Méth. Class. Hym.,' p. 281 (♂). Latreille, 1809, 'Gen. Crust. Ins.,' IV, p. 124 (♂). Shuckard, 1840, Ann. Nat. Hist., V, p. 271 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 79 (♂). Guérin, in Lefebvre, 1848, 'Voy. Abyssinie,' IV, Zool., pt. 6, p. 353. F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 2 (♂), Pl. i, fig. 7. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ost-Afrika, Gliederthiere,' p. 357 (♂). Ritsema, 1874, Tijdschr. v. Ent., XVII, p. 182 (♂). Emery, 1892, Ann. Soc. Ent. France, LXI, Bull., p. liv; 1892, ibid., XL, (1891), p. 555. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 12. H. Stadelmann, 1893, Mitth. Deutsch. Schutzgeb., VI, p. 217. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 42. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 1 (♂). F. C. Wellman, 1908, Ent. News, XIX, p. 226. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 212 (☿). Bingham, 1909, Trans. Zool. Soc. London, XIX, p. 180. Bequaert, 1913, Rev. Zool. Afr., II, p. 423. Lamborn, 1914, Trans. Ent. Soc. London, (1913), Proc., p. cxxii; 1914, ibid., (1914), Proc., p. vi. G. D. H. Carpenter, 1915, ibid., (1914), Proc., p. cvii.

? *Dorylus* sp. Waterhouse, 1907, Trans. Ent. Soc. London, Proc., p. vi, figs. (♃, ♀).

? *Dorylus nigritarsis* E. Strand, 1911, Jahrb. Nassau. Ver. Naturk. Wiesbaden, LXIV, p. 118 (♀).

Type locality: Sierra Leone.

Liberia: (Kieselbach). French Guinea: Konakry (F. Silvestri). Ivory Coast: Assinie (C. Alluaud). Nigeria: Moor Plantation near Ibadan; Agege (Lamborn). Cameroon: (Sjöstedt); Mowange (C. Feldmann); Jabassi (Riggenbach); Yaunde (Scheunemann); Bipindi (Zenker); Bibundi (Tessmann); Mukonje Farm (R. Rohde). Spanish Guinea: Alen (Tessmann). French Congo: Brazzaville (A. Weiss). Portuguese Congo: Landana. Belgian Congo: Elisabethville, Katanga (J. Bequaert); Congo da Lemba (R. Mayné); Kitobola (Rovere); Mayombe (de Briey; Cabra); Chikai (Cabra); Zambi (don Lopez); northwestern shore of Lake Tanganyika (Grauer). Nyasaland: Madona, Nyamyas (Montgomery). German East Africa: Amani (Zimmer); Tanga (H. Prell). Zanzibar: (Stuhlmann). British East Africa: Bura Mts. (v. d. Decken). Uganda: M'Bale (C. Alluaud); Bihunga (Duke of Abruzzi); Mubuku Valley, eastern slopes of Mt. Ruwenzori, 5000–7000 ft. (Woosnam); Bugalla Island; Damba Island (G. D. H. Carpenter). Western Abyssinia: (Ilg). Anglo-Egyptian Sudan: Renk (I Trägårdh).

25*a*. Subsp. **arcens** (Westwood) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 706 and 710 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 12 (☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 157 and 160, figs. A*1* and B*4* (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (♃, ☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 373 (☿). See p. 46.

Anomma arcens Westwood, 1847, Trans. Ent. Soc. London, V, p. 17 (☿), Pl. i, figs. 3 and 3*a-f*. Savage, 1849, Proc. Acad. Nat. Sci. Philadelphia, IV, p. 196 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 114, Pl. viii, fig. 3. Roger, 1861, Berlin. Ent. Zeitschr., V, p. 46 (☿); 1863, 'Verzeich. Formicid.,' p. 20. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 394. Perkins, 1869, American Naturalist, III, pp. 360–364 (☿). Emery, 1892, Ann. Soc. Ent. France, LXI, Bull., p. liv. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8. M L. Sykes, 1900, Trans. Manchester Microsc. Soc., XX, (1899), p. 89.

Anomma burmeisteri subsp. *arcens* Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 554 (☿).

Anomma pubescens Roger, 1861, Berlin. Ent. Zeitschr., V, p. 47 (☿); 1863, 'Verzeich. Formicid.,' p. 21. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 395. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 711 (☿).

Dorylus (Anomma) nigricans subsp. *burmeisteri* var. *arcens* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿).

Type locality: Cape Palmas, Liberia (Savage).

Sierra Leone: Kortright Hill (W. G. Clements). Ivory Coast: (Lohier); Assinie (C. Alluaud). Gold Coast: Aburi (F. Silvestri). French Congo: Fort Crampel (Schubotz); Brazzaville (A. Weiss); Gaboon. Belgian Congo: Medje (Lang and Chapin).

25*b*. Subsp. **burmeisteri** (Shuckard) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 706 and 710–713, figs. A, B (☿, ♂). Wasmann, 1904, ibid., Suppl. VII, pp. 671 and 675 (☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 157, figs. A*4*, B*12*, and B*16* (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿). See p. 46.

Anomma burmeisteri Shuckard, 1840, Ann. Nat. Hist., V, p. 326 (☿). Westwood, 1840, Ann. Mag. Nat. Hist., VI, p. 88 (☿), Pl. ii, figs. 4 and 4*a*. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 114, Pl. viii, fig. 2. Roger, 1861, Berlin. Ent. Zeitschr., V, p. 46 (☿); 1863, 'Verzeich. Formicid.,' p. 20. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 395. Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 554 (☿). Dalla Torre, 1893 'Cat. Hym.,' VII, p. 9. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 77. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (☿). Wasmann, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, p. 143; 1917, Zeitschr. Wiss. Zool., CXVII, p. 318.

Dorylus (Anomma) burmeisteri Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 373 (☿).

Type locality: Sierra Leone (D. F. Morgan).

Senegambia. Nigeria: Ibadan (F. Silvestri). Fernando Po: on the Peak, at 2400 m. (Schultze). Cameroon: Grand Batanga (G. Schwab). French Congo: Ogowe (Mocquerys). Belgian Congo: Duma; Libenge (Schubotz); Katala (J. Bequaert); Stanleyville; Lukolela to Basoko (Lang and Chapin). German East Africa: Mhonda (Stuhlmann). Zanzibar: (Stuhlmann).

$25b_1$. Var. **hybridus** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 157 and 161, fig. *B14* (☿). F. Silvestri, 1913, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 145. Santschi, 1914, ibid., p. 332 (☿). F. Silvestri, 1914, 'Report Exped. to Africa in Search Nat. Enem. Fruit Flies,' p. 128.

Type locality: Casamance (Claveau).

French Guinea: Konakry; Kakoulima; Kindia (F. Silvestri).

$25b_2$. Var. **molestus** (Gerstæcker) Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 7 (☿). Sjöstedt, 1908, ibid., II, 8, p. 108. Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 156 and 162, figs. A5 and *B15* (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 62 (☿).

Anomma molesta Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿). Roger, 1861, Berlin. Ent. Zeitschr., V, p. 47. Gerstæcker, in Peters, 1862, 'Reise n. Mossambique,' Zool., V, p. 302 (☿), Pl. xxxii, fig. 2. Roger, 1863, 'Verzeich. Formicid.,' p. 21. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 395. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 347 (☿). Emery, 1887, Bull. Soc. Ent. Italiana, XIX, p. 348, footnote. Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, pp. 30 and 290.

Anomma burmeisteri Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 271, figs. (☿) (*nec* Shuckard).

Anomma burmeisteri var. *molesta* Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 554 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 9.

Dorylus (Anomma) nigricans var. *molestus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 710 (☿); 1901, Mem. Accad. Sc. Bologna, (5) IX, p. 416 (☿). Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, pp. 671–673 and 675 (☿). Zavattari, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 550, p. 2 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 12. Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 375 (☿, ♂). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 162 (☿). Swynnerton, 1916, Trans. Ent. Soc. London, (1915), pp. 317–348 (☿).

Dorylus (Anomma) nigricans subsp. *molesta* Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 1 (♃, ☿).

Alaopone antinorii Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 275, figs. (☿).

Dorylus antinorii Emery, 1887, Bull. Soc. Ent. Italiana, XIX, p. 349. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10.

Dorylus (*Alaopone*) *antinorii* EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707 and 736 (☿).

Type locality: Tete, PORTUGUESE EAST AFRICA (Peters).

BENGUELA: (J. Cruchet). PORTUGUESE EAST AFRICA: Mts. of Morumballe on the Zambesi R. (Luja). RHODESIA: Kazungula (Jallá); Mt. Chirinda (Swynnerton); Luapula River (Elena d'Aosta). GERMAN EAST AFRICA: Ruanda (Elena d'Aosta); Mt. Karisimbi; southern Mpororo; Isalinio (Schubotz); Usambara (Vosseler); New Moschi, Mt. Kilimanjaro, 800 m.; Kilema, 1400-1500 m. (Alluaud and Jeannel); Kibonoto, Mt. Kilimanjaro; Mt. Meru, 3000 m. (Sjöstedt). UGANDA: Unyoro Province, Lake Albert Region, Waki River; Mt. Ruwenzori, eastern slope, 1600 m. (C. Alluaud). BRITISH EAST AFRICA: Mt. Kenia, 2400–2800 m.; Bura Mts., Wa-Taita Province (v. d. Decken; C. Alluaud); Mombasa, Freretown; Naivasha, Rift Valley (Alluaud and Jeannel). ABYSSINIA: Let Marefia, Schoa (Antinori).

$25b_3$. Var. **ornatus** SANTSCHI, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 157 and 161 (☿).

Type locality: CAMEROON.

$25b_4$. Var. **pallidus** SANTSCHI, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 157 and 160, fig. B*1* (☿).

Type locality: CAMEROON.

$25b_5$. Var. **rubellus** (SAVAGE) SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿); 1912, Ann. Soc. Ent. Belgique, LVI, p. 157, fig. B*2* (♃). See p. 47.

Anomma rubella SAVAGE, 1849, Proc. Acad. Nat. Sci. Philadelphia, IV, p. 196 (☿). F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 199 (☿). ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 47 (♃); 1863, 'Verzeich. Formicid.,' p. 21. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 395. F. SMITH, 1863, Trans. Ent. Soc. London, (3) I, p. 470 (☿).

Anomma pubescens EMERY, 1881, Ann. Mus. Civ. Genova, XVI, p. 273.

Anomma burmeisteri var. *rubella* EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 554 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 9. WASMANN, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, pp. 672 and 675 (☿); 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, pp. 95, 96, 97, 102, 104, 137, 140, and 146; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 271, 275, 298, 314, 319, and 321.

Dorylus (*Anomma*) *nigricans* var. *rubellus* EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 710 (☿); 1899, Ann. Soc. Ent. Belgique, XLIII, p. 462 (☿). SJÖSTEDT, 1908, 'Exped. Kilimandjaro, Meru., etc.,' II, 8, p. 111. EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 12. FOREL, 1911, Rev. Zool. Afr., I, p. 275 (☿). SANTSCHI, ibid., p. 206. FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (☿).

Dorylus nigricans var. *rubellus* SJÖSTEDT, 1904, 'I Västafrikas Urskogar,' p. 157, footnote.

Dorylus (*Anomma*) *rubellus* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 77 (☿).

Anomma nigricans subsp. *rubella* WASMANN, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 289.

Type locality: Mpongwe District, FRENCH CONGO (Savage).

CAMEROON: Buea (German Deep Sea Exp.). FRENCH CONGO: Gaboon. BELGIAN CONGO: Lukula (Daniel); Mayombe (de Briey); St. Gabriel near Stanleyville (H. Kohl); Boma (Lang and Chapin). BENGUELA: (J. Cruchet). GERMAN EAST AFRICA: Mafia Island (Voeltzkow).

25*c*. Subsp. **sjœstedti** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 461 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 12. Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 156 and 160, figs. A*2*, B*5*, and B*17* (☿). See p. 48.

Dorylus nigricans var. *sjöstedti* Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 157, footnote; 1908, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 111.

Anomma nigricans subsp. *arcens* Mayr, 1896, Ent. Tidskr., XVII, p. 225 (☿) (*nec* Westwood).

Anomma nigricans subsp. *sjöstedti* Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 672 (☿). Reichensperger, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 124.

Dorylus (*Anomma*) *nigricans* subsp. *sjöstedti* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (♃, ☿). Wasmann, 1912, Zool. Anzeiger, XXXIX, p. 473.

Anomma sjöstedti Wasmann, 1913, Ann. Rept. Smiths. Inst. for 1912, p. 471. H. Schmitz, 1914, Zool. Jahrb. Abt. Syst., XXXVII, p. 540. Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, pp. 31 and 32; 1916, ibid., V, pp. 96, 102, 107, 142, and 145; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 271, 298, 302, 314, 321, and 330.

Anomma sjæstedti H. Schmitz, 1917, Zoolog. Meded. Mus. Leiden, III, p. 125.

Type locality: Cameroon (Sjöstedt).

Fernando Po: (Conradt). Cameroon: (Mansfeld; Zenker); Mundame (Conradt); Molundu (Reichensperger); Victoria (German Deep Sea Exp.); Lolodorf; Grand Batanga (G. Schwab). French Congo: Krebedje, southern Darbanda (Decorse). Belgian Congo: Faradje; Medje; Niangara (Lang and Chapin).

25c_1. Var. **rufescens** (Wasmann) Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 12.

Anomma nigricans subsp. *sjöstedti* var. *rufescens* Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 673 (☿).

Dorylus (*Anomma*) *nigricans* subsp. *burmeisteri* var. *rufescens* Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, pp. 157 and 161, figs. A*3*, B*6*, and B*18* (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿).

Dorylus (*Anomma*) *nigricans* subsp. *rufescens* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 247, fig. 3 (♀).

Dorylus (*Anomma*) *nigricans* subsp. *rubescens* Santschi, 1917, ibid., LXXXV, (1916), p. 278 (♀).

Anomma sjostedti var. *rufescens* Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 32; 1916, ibid., V, p. 107; 1917, Zeitschr. Wiss. Zool., CXVII, p. 330.

Type locality: Victoria, Cameroon (German Deep Sea Exp.; F. Silvestri).

Cameroon: Yukaduma (Funck); Grand Batanga; Lolodorf (G. Schwab). French Congo: Samkita (F. Faure).

25c_2. Var. **sjöstedti-wilverthi** (Wasmann).

Anomma sjostedti var. *sjostedti-wilverthi* Wasmann, 1916, Ent. Mitt. Deutsch. Ent. Mus. Berlin, V, pp. 136 and 146; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 305 and 321 (☿).

Type locality: Grand Batanga, Cameroon (G. Schwab).

26. **Dorylus** (**Anomma**) **stanleyi** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 52 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 12 (♂). Forel, 1912, Ent. Mitt. Deutsch Ent. Mus. Berlin, I, p. 81 (♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 63 (♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 402 (♂).

?*Dorylus* (*Anomma*) *emeryi* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 52 (♂).

Type locality: Katanga, Belgian Congo (Lemaire).

Belgian Congo: (Kohl); Mawambi. British East Africa: Molo, Mau Escarpment, 2420 m.; Wambogo, Wa-Kikuyu, 1750 m.; Mt. Kenia, eastern slope, 1900–2000 m. (Alluaud and Jeannel). Uganda: Unyoro Province, Lake Albert Region (C. Alluaud).

27. **Dorylus** (**Anomma**) **wilverthi** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 459, fig. (☿); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 417 and 428 (☿), Pl. i, figs. 23–25. Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 674. Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 12 (☿, ♂). Forel, 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 177 (☿, ♀), Pl., figs. 2, 3*b*, 4*b*, 5, 9*a*, and 9*b*. See p. 48.

Anomma wilverthi Wasmann, 1900, Zool. Jahrb. Abt. Syst., XIV, pp. 257 and 263 (☿); 1904, ibid., Suppl. VII, pp. 660 and 671; 1911, 1er Congr. Intern. Entom. Bruxelles (1910), II, Mém., pp. 227 and 229, Pl. xxv, fig. 23; 1913, Ann. Rept. Smiths. Inst. for 1912, pp. 469 and 471, Pl. vii, fig. 23; 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, pp. 30, 31, 33, 34, 204, and 289; 1916, ibid., V, pp. 94, 95, 97, 98, 101, 104, 107, 108, 137, 140, 142, 143, and 146; 1917, Zeitschr. Wiss. Zool., CXVII, pp. 262, 271, 275, 276, 282, 296, 313, 318, 319, 321, 330, and 353.

Dorylus (*Anomma*) *wilwerthi* Wasmann, 1900, Zool. Jahrb. Abt. Syst., XIV, p. 274. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 51 and 70 (☿, ♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 352 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (♃, ☿). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 155. Forel, 1913, Rev. Zool. Afr., II, p. 311 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (☿); 1916, Rev. Suisse Zool., XXIV, p. 402 (♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 373 (☿).

Anomma nigricans Ern. André, 1900, Bull. Mus. Hist. Nat. Paris, VI, p. 365, 4 figs. (♀) (*nec* Illiger).

Anomma wilwerthi Wasmann, 1907, Atti Accad. Pontif. Nuov. Lincei, LX, Sess. 7, pp. 1–6.

Type locality: Leopoldville, Belgian Congo (Wilwerth).

Ivory Coast: Ouossou (Talbot). French Congo: Brazzaville; Krebedje (A. Weiss). Belgian Congo: Umangi (Wilwerth); Iringui (Lindemann); Mobeka (Lothaire); Kimpoko (Büttner); Ganda Sundi (R. Mayné); Kondué; Sankuru (Luja); St. Gabriel (Kohl); Akenge; Medje; Faradje; Avakubi (Lang and Chapin); Kwesi to Kilo (Bayer); Beni (Borgerhoff); Kimuenza (Schultze); Duma (Schubotz).

Subgenus 3. **Typhlopone** Westwood

Typhlopone Westwood, 1840, 'Introd. Class. Insects,' II, p. 219.

Dorylus subg. *Typhlopone* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 701 and 723; 1910, 'Gen. Insect., Dorylinæ,' p. 12.

Cosmaccetes Spinola, 1853, Mem. Accad. Sc. Torino, (2) XIII, p. 70.

Subgenotype: *Typhlopone fulva* Westwood, 1840.

28. **Dorylus** (**Typhlopone**) **fulvus** (Westwood) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707, 709, and 723, figs. P, Q (☿, ♂); 1899, Ann. Mus. Civ. Genova, XXXIX, p. 499 (☿); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416 and 428 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 13. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (☿).

Dorylus helvolus LATREILLE, 1805, 'Hist. Nat. Crust. Ins.,' XIII, p. 260 (♂, in part), Pl. C, fig. 10 (*nec* Linnæus).

Typhlopone fulva WESTWOOD, 1840, 'Introd. Class. Insects,' II, p. 219 (☿); 1840, Ann. Mag. Nat. Hist., VI, p. 87 (☿), Pl. II, figs. 1 and 1*a–g*. F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 110. ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 45; 1863, 'Verzeich. Formicid.,' p. 20.

Labidus (Typhlopone) kirbii SHUCKARD, 1840, Ann. Nat. Hist., V, p. 265 (☿).

Labidus (Typhlopone) thwaitsii SHUCKARD, ibid., p. 326 (☿).

Labidus (Typhlopone) spinolæ SHUCKARD, ibid., p. 327 (☿).

Dorylus juvenculus SHUCKARD, ibid., p. 318 (♂). WESTWOOD, 1842, 'Arcana Ent.,' I, p. 80 (♂). LUCAS, 1846, 'Explor. Sc. Algérie,' Zool., III, p. 299 (♂). ERN. ANDRÉ, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 254 (♂), Pl. XV, figs. 10–12. EMERY, 1887, Bull. Soc. Ent. Italiana, XIX, p. 350; 1891, 'Explor. Tunisie, Fourmis,' p. 1 (♂). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 11. WASMANN, 1899, Deutsch. Ent. Zeitschr., p. 175; 1900, Zool. Jahrb. Abt. Syst., XIV, p. 274. BINGHAM, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 61 (♂). WASMANN, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 676.

?*Dorylus labiatus* SHUCKARD, 1840, Ann. Nat. Hist., V, p. 319 (♂).

Typhlopone shuckardi WESTWOOD, 1840, Ann. Mag. Nat. Hist., VI, p. 88 (☿), Pl. II, fig. 2. F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 111. ROGER, 1863, 'Verzeich. Formicid.,' p. 20.

Typhlopone dahlbomii WESTWOOD, 1840, Ann. Mag. Nat. Hist., VI, p. 88 (☿), Pl. II, figs. 3*a–b*. F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 111. ROGER, 1863, 'Verzeich. Formicid.,' p. 20.

Typhlopona oraniensis LUCAS, 1846, 'Explor. Sc. Algérie,' Zool., III, p. 302 (☿), Pl. XVI, figs. 11 and 11*a–g*; 1853, Ann. Soc. Ent. France, (3) I, Bull., pp. xxxvii–xxxix (☿). NYLANDER, 1856, Ann. Sc. Nat. Zool., (4) V, p. 76 (☿), Pl. III, figs. 24–26.

Cosmaecetes homalinus SPINOLA, 1853, Mem. Accad. Sc. Torino, (2) XIII, p. 71 (☿). EMERY, 1893, Boll. Mus. Zool. Anat. Comp. Torino, VIII, No. 163, p. 1.

Typhlopone oraniensis F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 112. MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 737 (☿). ROGER, 1863, 'Verzeich. Formicid.,' p. 20. EMERY, 1877, Ann. Mus. Civ. Genova, IX, p. 381, fig. (☿). PASCOE, 1878, Trans. Ent. Soc. London, Proc., p. xxxviii. ERN. ANDRÉ, 1882, 'Spec. Hym. Europ. Algérie,' II, Pl. I, fig. 13 (☿). FOREL, 1885, Journ. Asiat. Soc. Bengal, LIV, p. 177 (☿).

Typhlopone homalina F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 111. ROGER, 1863, 'Verzeich. Formicid.,' p. 20.

Typhlopone spinolæ F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 111. ROGER, 1863, 'Verzeich. Formicid.,' p. 20.

Typhlopone thwaitesi F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 111. ROGER, 1863, 'Verzeich. Formicid.,' p. 20.

Typlopone spinolæ MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 457.

Typlopone thwaitsi MAYR, ibid., p. 457.

Typlopone dahlbomi MAYR, ibid., p. 457.

Typlopone shuckardi MAYR, ibid., p. 457.

Typlopone fulva MAYR, ibid., p. 457.

Typlopone oraniensis MAYR, ibid., p. 457.

Typlopone homalina MAYR, ibid., p. 457.

Dorylus oraniensis Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 252 (☿), Pl. xv, figs. 1–4.

Typhlopone clausii Joseph, 1882, Berlin. Ent. Zeitschr., XXVI, p. 47 (☿).

Dorylus clausii Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 252 (☿), Pl. xv, fig. 6.

Dorylus fulvus Emery, 1895, Ann. Soc. Ent. France, LXIV, Bull., p. lxxiii, fig. (☿, ♂); 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 595 (☿, ♂). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 42. R. Gestro, in Vanutelli and Citerni, 1899, 'Seconda Spedizione Bottego. L'Omo,' p. 627, fig. 20 (☿, ♂). F. Kohl, 1907, Denkschr. Ak. Wiss. Wien, LXXI, p. 281 (♂). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Zavatarri, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 212 (♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 333 (♂).

Dorylus fulvus fulvus Emery, 1919, Ann. Soc. Ent. Belgique, LIX, p. 102.

Type locality: unknown, "in saccharo detecta."

Senegambia: Thiès (F. Silvestri). Cameroon: Mundame (Conradt). Anglo-Egyptian Sudan: Khartum (F. Werner); Sennar. Abyssinia: Ogaden; Bela (Ruspoli); Lakes Bass Marle and Bass Narok (V. Bottego). Somaliland: Lugh (Ruspoli). Zanzibar: (Stuhlmann). Southern Arabia: Makalla (O. Simony). Sinai Peninsula. Syria. North Africa. Doubtful record: Pretoria, Transvaal (Wichgraf).

28*a*. Subsp. **badius** (Gerstæcker) Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 13. Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 375 (♂). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, pp. 111 (☿, ♂) and 350 (♂); 1913, Rev. Zool. Afr., II, p. 312 (♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 63 (♃, ☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 125 (♃, ☿, ♂), Pl. iv, figs. 31, 31*a*, 32, 32*a*, and 32*b*. Emery, 1919, Ann. Soc. Ent. Belgique, LIX, p. 102. Wheeler, 1921, Proc. American Ac. Arts Sci. Boston, LVI, p. 303, fig. 5a (♂).

Dorylus badius Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 261 (♂); in Peters, 1862, 'Reise n. Mossambique,' Zool., V, p. 499 (♂), Pl. xxxi, fig. 14. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Gerstæcker, 1872, Stettin. Ent. Zeitg., XXXIII, p. 257 (☿, ♂).

Dorylus juvenculus var. *badius* Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 112 (♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (♂).

Dorylus (Typhlopone) fulvus var. *badius* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp 709 and 724, figs. P and R (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 8 (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 52 (♂).

Type locality: Mozambique (Peters).

Gold Coast: Akra (Unger). Belgian Congo: Kondué, Kasai (Luja); Lukula (Daniel); Kabambare (Flamand); Volcano region N. E. of Lake Kivu (Schubotz). Rhodesia: Bulawayo (G. Arnold). German Southwest Africa: Windhoek (Lübbert); Okahandja (Casper; Peters); Ontys (Langheld). Bechuanaland: between Severelela and Khakhea (L. Schultze). Cape Province: Cape Town (Wilms). Mozambique: Inhambane (Fornasini). German East Africa: Tanga; New

Moschi, Mt. Kilimanjaro (Alluaud and Jeannel); Kibonoto, Kilimanjaro and Masai Steppe (Sjöstedt). British East Africa: Mt. Kenia, Meranga; Fort Hall, Nairobi; Mombasa Island (Alluaud and Jeannel). Uganda: Unyoro Province near Hoima, east of Lake Albert (C. Alluaud); Lake Victoria (Zimmer); Entebbe (Duke of Abruzzi).

$28a_1$. Var. **eurous** Emery, 1919, Ann. Soc. Ent. Belgique, LIX, p. 102.

Dorylus fulvus subsp. *euroa* Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 5, figs. 1 and 2 (☿, ♂).

Type locality: Keren, Eritrea (F. Silvestri).

Eritrea: Ghinda; Nefasit (F. Silvestri).

$28a_2$. Var. **obscurior** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 333 (♃). Emery, 1919, Ann. Soc. Ent. Belgique, LIX, p. 102. See p. 49.

Type locality: Konakry, French Guinea (F. Silvestri).

Belgian Congo: Vankerckhovenville; Faradje; Garamba; Batama; Stanleyville (Lang and Chapin); Avakubi (Boyton).

28*b*. Subsp. **dentifrons** Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 674 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 13 (☿); 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 5, fig. 1 (☿); 1919, Ann. Soc. Ent. Belgique, LIX, p. 102.

Dorylus fulvus var. *stramineus* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (♃, ☿).

Type locality: Sankuru, Belgian Congo (E. Luja).

Cameroon: (Zenker).

28*c*. Subsp. **glabratus** (Shuckard) Emery, 1910, 'Gen. Insect., Dorylinæ,' p 13 (♂).

Dorylus glabratus Shuckard, 1840, Ann. Nat. Hist., V, p. 317 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 79 (♂). F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 2 (♂), Pl. I, fig. 8. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Radoszkowsky, 1876, Hor. Soc. Ent. Rossicæ, XII, p. 140. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 11. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200 (♂).

Dorylus (*Typhlopone*) *fulvus* ? var. *glabratus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 709 and 724.

Type locality: Gambia.

Egypt. Zanzibar: (Stuhlmann).

28*d*. Subsp. **rhodesiæ** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 111 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 129 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 5, fig. 1 (☿); 1919, Ann. Soc. Ent. Belgique, LIX, p. 102.

Dorylus (*Typhlopone*) *fulvus* subsp. *rhodesianus* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 333 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

Transvaal: Pretoria (F. Silvestri).

Subgenus 4. **Rhogmus** Shuckard

Rhogmus Shuckard, 1840, Ann. Nat. Hist., V, p. 323.

Dorylus subg. *Rhogmus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 702 and 736; 1910, 'Gen. Insect., Dorylinæ,' p. 13.

Subgenotype: *Rhogmus fimbriatus* Shuckard, 1840.

29. **Dorylus (Rhogmus) fimbriatus** (Shuckard) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 709 and 736, figs. AA and BB (☿, ♂); 1899, Ann. Mus. Civ. Genova, XXXIX, p. 499 (♂); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416, 419, and 428 (☿), Pl. I, figs. 31–38. Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 47 (♂). H. Brauns, 1903, Zeitschr. f. Hym. u. Dipt., III, pp. 294–298, fig. (♀). Mayr, in Sjostedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 8 (♂). Forel, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (♂); 1909, Ann. Soc. Ent. Belgique, LIII, pp. 52 and 71 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 14 (☿, ♀, ♂). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (♂). Santschi, 1911, Rev. Zool. Afr., I, p. 207 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 375 (♂). Forel, 1912, Ent. Mitt. Deutsch. Ent. Mus. Berlin, I, p. 81 (♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 333 (☿, ♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 65 (♂). Arnold, 1915, Ann. South African Mus., XIV, p. 129 (♃, ☿, ♀, ♂), Pl. IV, figs. 36, 36a. Santschi, 1919, Rev. Zool. Afr., VI, p. 23 (♂).

Rhogmus fimbriatus Shuckard, 1840, Ann. Nat. Hist., V, p. 325 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 80 (♂). F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 4 (♂), Pl. I, fig. 2. Roger, 1863, 'Verzeich. Formicid.,' p. 42. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 453. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 347 (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8. Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 369 (♂).

Dorylus fimbriatus H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 42. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 2 (☿). Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 61 (♂). Poulton, in A. J. Hayes, 1905, 'The Source of the Blue Nile,' p. 314 (♂).

Type locality: Gambia.

French Guinea: Konakry; Mamou (F. Silvestri). Gold Coast. Cameroon. French Congo: Gaboon. Belgian Congo: Sankuru (Luja); Katanga (Lemaire). Benguela: Cucala (J. Cruchet). Southern Rhodesia: Salisbury (G. Marshall). Nyasaland: Fort Johnston (Rendall). German East Africa: Mpororo; Marangu (Zimmer); Tanga, Caves of Kulumuzi (Alluaud); Kibonoto, Mt. Kilimanjaro, 1000–1900 m. (Sjöstedt). Zanzibar: (v. d. Decken). British East Africa: Molo, Mau Escarpment, 2400 m.; Wambogo, Wa-Kikuyu, 1750 m.; Nairobi; Mt. Kenia, N'daika, 2200 m. (Alluaud and Jeannel). Uganda: Unyoro Province, east of Lake Albert (C. Alluaud). Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh); Lake Tsano (A. J. Hayes). Somaliland. Abyssinia: Buditu to Dimé (V. Bottego); Adis-Abeba (Kachovskij).

29_1. Var. **crampeli** Santschi, 1919, Rev. Zool. Afr., VI, pp. 231 and 232 (♂). Type locality: Fort Crampel, French Congo.

29_2. Var. **lævipodex** Santschi, 1919, Rev. Zool. Afr., VI, pp. 231 and 232 (♂). Type locality: British East Africa.

29_3. Var. **poweri** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 217 (☿). Type locality: Kimberley, Cape Colony (Power).

30. **Dorylus (Rhogmus) fuscipennis** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 709 and 737, figs. CC and DD (♂); 1901, Mem. Accad. Sc. Bologna, (5) IX, pp. 416 and 428 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 14 (♂). Forel, 1910, Notes Leyden Mus., XXXI, p. 224, footnote (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 349 (☿). Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (♂).

Rhogmus fuscipennis Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 570 (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8.

Type locality: West Africa.

Haitifi. Gold Coast: Aburi (Fisch). French Congo: Ogowe (Mocquerys).

30_1. Var. **lugubris** Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (♂); 1919, ibid., VII, p. 91.

Dorylus (Rhogmus) fimbriatus var. *lugubris* Santschi, 1919, ibid., VI, p. 232 (♂).

Type locality: Aburi, Gold Coast (Fisch).

30_2. Var. **marginiventris** Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (♂); 1919, ibid., VII, p. 91.

Dorylus (Rhogmus) fimbriatus var. *marginiventris* Santschi, 1919, ibid., VI, p. 233 (♂).

Type locality: Dimbroko, Ivory Coast (Le Moult).

31. **Dorylus (Rhogmus) leo** Santschi, 1919, Rev. Zool. Afr., VI, pp. 231 and 232 (♂).

Type locality: Dimbroko, Ivory Coast.

?32. **Dorylus (Rhogmus) ocellatus** (Stitz).

Dichthadia sp. Stitz, 1909, Zool. Anzeiger, XXXV, p. 231, figs. 1–3 (♀). Wasmann, 1911, Rev. Zool. Afr., I, p. 113.

Dichthadia ocellata Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (♀).

Type locality: Bipindi, Cameroon (Zenker).

33. **Dorylus (Rhogmus) savagei** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 709 and 738, figs. EE and FF (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 52 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 14 (♂). Forel, 1911, Rev. Zool. Afr., I, p. 275 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 348 (♂). Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (♂).

Rhogmus fuscipennis Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂) (*nec* Emery).

Type locality: Gaboon, French Congo.

Belgian Congo: Lukula (Daniel); Mayombe (Deleval); Tshoa (Cabra).

33_1. Var. **mucronatus** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 462 (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 14 (♂). Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (♂).

Dorylus (Rhogmus) savagei subsp. *mucronatus* Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 47 (♂).

Type locality: Lagos, Nigeria.

Nigeria: Wari, Forcados River (Henry Fischer).

34. **Dorylus (Rhogmus) termitarius** Wasmann, 1911, Rev. Zool. Afr., I, p. 111 (☿, ♀), Pl. I, fig. 4.

Type locality: Romée near Stanleyville, Belgian Congo (H. Kohl).

Subgenus 5. **Alaopone** Emery

Alaopone Emery (part), 1881, Ann. Mus. Civ. Genova, XVI, p. 274.

Dorylus subg. *Alaopone* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 702 and 730; 1910, 'Gen. Insect., Dorylinæ,' p. 14.

Dorylus subg. *Shuckardia* (part) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 703 and 740.

Subgenotype: *Alaopone oberthüri* Emery, 1881 = *Dorylus orientalis* Westwood, 1835.

35. **Dorylus (Alaopone) atriceps** Shuckard. Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂). Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 362 (♂). **See p. 51.**

Dorylus atriceps Shuckard, 1840, Ann. Nat. Hist., V, p. 323 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 80 (♂). F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 4 (♂), Pl. I, fig. 14. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 198. Ern. André, 1886, 'Spec. Hym. Europ. Algérie,' II, p. 840 (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 5 (♂).

Dorylus shuckardi Ritsema, 1874, Tijdschr. v. Ent., XVII, p. 182 (♂).

Dorylus ritsemæ Dalla Torre, 1892, Wien. Ent. Zeitg., XI, p. 89 (♂).

Dorylus atriceps var. *shuckardii* Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10.

Dorylus (Shuckardia) atriceps Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 710 and 740, figs. HH and GG (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♂).

Type locality: Gambia River, Gambia.

Senegambia. Guinea. Ivory Coast: Dimbroko (Le Moult). French Congo: Ogowe (Mocquerys). Belgian Congo: Vivi; Chikai (Cabra); Faradje; Stanleyville (Lang and Chapin). Angola: (Welwitsch). Abyssinia. Tunis.

35_1. Var. **katanensis** Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 375 (♂).

Type locality: Plain south of Lake Albert Edward, Belgian Congo (Schubotz).

35a. Subsp. **æthiopicus** Emery. Forel, 1907, Ann. Soc. Ent. Belgique, LI, p. 201 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (☿, ♂).

Dorylus atriceps Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 381 (♂) (*nec* Shuckard).

Dorylus (Shuckardia) atriceps subsp. *æthiopicus* Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 710 and 741, figs. JJ and KK (♂). Santschi, 1907, Rev. Suisse Zool., XV, p. 327 (☿).

Type locality: Sudan.

Eritrea: Anseba (Beccari). Tunis: Kairouan (F. Santschi).

36. **Dorylus (Alaopone) attenuatus** Shuckard. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 709 and 733, figs. X, Y (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (♂); 1913, Rev. Zool. Afr., II, p. 312 (♂). Arnold, 1915, (misspelled *attenatus*) Ann. South African Mus., XIV, p. 133 (♂).

Dorylus attenuatus Shuckard, 1840, Ann. Nat. Hist., V, p. 322 (♂). Westwood, 1842, 'Arcana Ent.,' I, p. 80 (♂). F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 3 (♂), Pl. I, fig. 13. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. Radoszkowsky, 1876, Hor. Soc. Ent. Rossicæ, XII, p. 140. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 10. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 61 (♂).

Type locality: Gambia River, Gambia.

BELGIAN CONGO: Valley of the Lubumbashi (Buttgenbach). GERMAN SOUTHWEST AFRICA: (Lubbert). BECHUANALAND: Lobatsi, north of Mafeking (L. Schultze). CAPE PROVINCE: Cape of Good Hope. TRANSVAAL: Pretoria (Distant). ABYSSINIA: (Raffray).

36_1. Var. **acuminatus** EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 462 (♂). MAYR, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 8 (♂). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 133 (♂).

Type locality: ORANGE FREE STATE.

GERMAN EAST AFRICA: Kibonoto, Mt. Kilimanjaro, 1000–1200 m. (Sjöstedt).

36_2. Var. **umbratipennis** FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 52 (♂). EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂).

Type locality: Nini (? probably Vivi, BELGIAN CONGO).

36a. Subsp. **latinodis** FOREL, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 479 (♂).

Type locality: Stanleyville, BELGIAN CONGO (H. Kohl).

37. **Dorylus (Alaopone) buyssoni** SANTSCHI, 1910, Rev. Suisse Zool., XVIII, p. 748, figs. 7*a*, *b*, *d*, and *e* (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 65 (♂).

Type locality: Nairobi, Wa-Kikuyu, BRITISH EAST AFRICA (C. Alluaud).

BRITISH EAST AFRICA: Cheteni (Alluaud and Jeannel).

37_1. Var. **conjugens** SANTSCHI, 1910, Rev. Suisse Zool., XVIII, p. 750, figs. 7*c* and *f* (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 65 (♂).

Type locality: Mombasa, Athi Plains, BRITISH EAST AFRICA (Fernique).

BRITISH EAST AFRICA: Mwatate, Wa-Taita Province (C. Alluaud).

38. **Dorylus (Alaopone) conradti** EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 707 and 734, fig. Z (☿, ♀), Pl. XVI, figs. 1–4, and Pl. XVII, figs. 7–10; 1901, Mem. Accad. Sc. Bologna, (5) IX, p. 428 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 15 (☿, ♀). WASMANN, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 136. See p. 51.

Type locality: Bismarckburg, TOGO (Conradt).

CAMEROON: Soppo (v. Rothkirch). BELGIAN CONGO: Niangara (Lang and Chapin).

39. **Dorylus (Alaopone) diadema** GERSTÆCKER. EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 134 (♂).

Dorylus diadema GERSTÆCKER, 1858, Monatsb. Ak. Wiss. Berlin, p. 261 (♂); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 500 (♂), Pl. XXXI, fig. 15. ROGER, 1863, 'Verzeich. Formicid.,' p. 41. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 408. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 10. FOREL, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 309 (♂).

Dorylus (Shuckardia) diadema EMERY, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 710 and 742, figs. MM and LL (♂).

Type locality: Tete, MOZAMBIQUE (Peters).

39_1. Var **fusciceps** EMERY, 1910, 'Gen. Insect., Dorylinæ,' p. 15 (♂).

Dorylus (Shuckardia) diadema var. *fusciceps* EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 463 (♂).

Type locality: Lake Nyasa.

Congo.

39a. Subsp. **arnoldi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 216 (♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

40. **Dorylus** (**Alaopone**) **distinctus** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 747, fig. 6 (♂).

Type locality: French Guinea (Marchand).

41. **Dorylus** (**Alaopone**) **montanus** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 750, fig. 8 (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 66 (☿).

Type locality: Kibosho, Mt. Kilimanjaro, 1400 m., German East Africa (C. Alluaud).

German East Africa: New Moschi, 800 m.; Kilema, 1440 m. (Alluaud and Jeannel).

41_1. Var. **bondroiti** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 162 (♂). Arnold, 1915, Ann. South African Mus., XIV, p. 135 (♂).

Dorylus (*Alaopone*) *montanus* subsp. *bondroiti* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 248 (♂).

Type locality: Transvaal.

Cape Province: Steynsburg (Ellenberger).

41a. Subsp. **australis** Santschi, 1919, Rev. Zool. Afr., VI, p. 231 (☿).

Dorylus (*Alaopone*) *australis* Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 362 (☿).

Type locality: Majuba, Herschel District, Cape Province (G. Arnold).

41b. Subsp. **brevis** Santschi, 1919, Rev. Zool. Afr., VI, p. 245, fig. 1 (♂).

Type locality: Wombali, Belgian Congo (Vanderyst).

Ecitonini Forel

Ænictogiton Emery

Ænictogiton Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 49; 1910, 'Gen. Insect., Dorylinæ,' p. 27.

Genotype: *Ænictogiton fossiceps* Emery, 1901.

1. **Ænictogiton bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 314 (♂).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

2. **Ænictogiton elongatus** (Santschi).

Ænictogeton elongatus Santschi, 1919, Rev. Zool. Afr., VI, p. 246, fig. 2c (♂).

Type locality: Malela, Belgian Congo (Burgeon).

2_1. Var. **attenuatus** Santschi, 1919, Rev. Zool. Afr., VI, p. 247, fig. 2b (♂).

Type locality: 300 km. south of Kindu, Belgian Congo (Burgeon).

3. **Ænictogiton emeryi** Forel, 1913, Rev. Zool. Afr., II, p. 315 (♂).

Type locality: Valley of the Lubumbashi, Belgian Congo (Buttgenbach).

4. **Ænictogiton fossiceps** Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 49, figs. 3 and 4 (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 28 (♂).

Type locality: Congo.

5. **Ænictogiton sulcatus** (Santschi).

Ænictogeton sulcatus Santschi, 1919, Rev. Zool. Afr., VI, p. 247, fig. 2a (♂).

Type locality: Kataki, Belgian Congo (Gérard).

Ænictus Shuckard[1]

Ænictus Shuckard, 1840, Ann. Nat. Hist., V, p. 266 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 28.

Typhlatta F. Smith, 1858, Journ. Linn. Soc. London, Zool., II, p. 79 (☿).

Eciton (part) F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 153.

Alaopone (part) Ern. André, 1886, 'Spec. Hym. Europ. Algérie,' II, p. 854.

Dorylus subg. *Shuckardia* (part) Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, pp. 703 and 740.

Genotype: *Ænictus ambiguus* Shuckard, 1840.

1. **Ænictus asperivalvus** Santschi, 1919, Rev. Zool. Afr., VI, p. 233 (♂); 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 373, fig. 10 (♂).

Type locality: Dimbroko, Ivory Coast (Le Moult).

2. **Ænictus batesi** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 255 (☿).

Type locality: Old Calabar, Nigeria (Bates).

3. **Ænictus bottegoi** Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 499, fig. (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 31 (♂).

Type locality: Lake Bass Narok, Abyssinia (V. Bottego).

3₁. Var. **alluaudi** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 754, fig. 10 (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 67 (♂).

Type locality: Kisumu, Victoria Nyanza, British East Africa (C. Alluaud).

British East Africa: Nairobi, Wa-Kikuyu; Athi Basin, Ndarugo River (C. Alluaud).

3a. Subsp. **anceps** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 249 (♂).

Ænictus anceps Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 374, fig. 11 (♂).

Type locality: Nefasit, Eritrea (K. Escherich).

Eritrea: Ghinda (K. Escherich).

3b. Subsp. **noctivagus** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 303, fig. 1 (♂).

Type locality: Abyssinia.

4. **Ænictus buttgenbachi** Forel, 1913, Rev. Zool. Afr., II, p. 313 (♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 68 (☿, ♂).

Type locality: Valley of the Lubumbashi, Belgian Congo (Buttgenbach).

German East Africa: Kilema, Mt. Kilimanjaro, 1440 m.; New Moschi, 800 m. (Alluaud and Jeannel).

5. **Ænictus congolensis** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 277 (☿, ♀), Pl. I.

Ænictus rixator var. *congolensis* Santschi, 1911, Rev. Zool. Afr., I, p. 207 (☿).

Type locality: French Congo (A. Weiss).

French Congo: Lambarene (F. Faure).

6. **Ænictus crucifer** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 68, fig. 5 (♂).

Type locality: Tiwi, British East Africa (Alluaud and Jeannel).

7. **Ænictus decolor** (Mayr) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 7. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 746 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 143 (☿).

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[1] *Ænictus unicolor* "Smith," recorded from Angola (Welwitsch) by Radoszkowsky, Jorn. Sci. Ac. Lisboa, VIII, No. 31, 1881, p. 198, has apparently never been described.

Typhlatta decolor Mayr, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 668 (☿).
Type locality: East Africa.

8. **Ænictus eugenii** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 17 (☿), Pl. ii, figs. 1–4; 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (☿). Wasmann, 1900, ibid., XIV, pp. 268 and 275. H. Brauns, 1901, Zeitschr. f. Hym. u. Dipt., I, p. 17. Wasmann, 1904, Zool. Jahrb. Abt. Syst., Suppl. VII, p. 676. Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 255 (☿). Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, pp. 28 and 203.

Ænictus eugenia Arnold, 1915, Ann. South African Mus., XIV, p. 139 (☿), Pl. iv, fig. 38.

Type locality: Makapan, Transvaal (E. Simon).

Orange Free State: Bothaville (H. Brauns). Southern Rhodesia: Bulawayo (G. Arnold).

8_1. Var. **brazzai** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 355 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

8a. Subsp. **caroli** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 248 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (☿).

Type locality: Nefasit, Eritrea (K. Escherich).

Eritrea: Ghinda (F. Silvestri).

9. **Ænictus foreli** Santschi, 1919, Rev. Zool. Afr., VI, p 234 (♂); 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 369 (♂).

Type locality: Dimbroko, Ivory Coast (Le Moult).

10. **Ænictus furculatus** Santschi, 1919, Rev. Zool. Afr., VII, p. 91; 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 373, fig. 10 (♂).

Ænictus forculatus Santschi, 1919, Rev. Zool. Afr., VI, p. 233 (♂).

Type locality: Saint Louis, Senegambia (Le Moult).

11. **Ænictus fuscovarius** Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (♂); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 501 (♂), Pl. xxxii, fig. 1. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 394. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 7. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (♂); 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 597 (♂). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 249 (♂). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (♂). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 67 (♂).

Type locality: Tete, Mozambique (Peters).

Belgian Congo: Sampwe (J. Bequaert). British East Africa: Voi, Taita, 600 m.; Taveta, 750 m.; Landjoro, Pori, 900 m. (Alluaud and Jeannel). Abyssinia: Ganale; Lake Abaja; Bela; Magala Re Umberto; Webi (Ruspoli). Eritrea: Ghinda (K. Escherich).

11_1. Var. **magrettii** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (♂). Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 2 (♂); 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31. Santschi, 1910, Rev. Suisse Zool., XVIII, p. 756 (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 67 (♂).

Ænictus inconspicuus Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 539 (♂) (*nec* Westwood); 1884, Bull. Soc. Ent. Italiana, XV, (1883) p. 244 (♂).

Ænictus magrettii Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 569 (♂), Pl. xv, figs. 13, 14; 1892, Ann. Mus. Civ. Genova, XXXII, p. 110, fig. (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8.

Type locality: Anglo-Egyptian Sudan (Magretti).

Senegambia: Gorée Island (H. Brauns). British East Africa: Taveta; Bura, Wa-Taita Province (Alluaud and Jeannel). Somaliland: Errer-es-Saghir (Bricchetti-Robecchi). Abyssinia: Diré Daua; Bazen (Magretti). Eritrea: Sogodas (Magretti). Anglo-Egyptian Sudan: White Nile (I. Tragårdh); Khartum (F. Werner); Kor Guillo; Bahr-el-Salaam; El Hefera (Magretti).

12. **Ænictus hamifer** Emery, 1896, Ann. Mus. Civ. Genova, XXXVII, p. 153, fig. (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 31 (♂). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 250 (♂); 1912, Ent. Mitt. Deutsch. Ent. Mus. Berlin, I, p. 81 (♂). Santschi, 1910, Rev. Suisse Zool., XVIII, p. 756 (♂).

Type locality: Maddo Wells, British East Africa (V. Bottego).

Abyssinia: Confluence of the Webi and Ganale Rivers (V. Bottego); Diré Daua (Magretti). Eritrea: Ghinda (K. Escherich). British East Africa.

13. **Ænictus humeralis** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 752, figs. 9a–e (♂).

Type locality: Bamako, French Sudan (Chevalier).

13_1. Var. **chevalieri** Santschi, 1910, Rev. Suisse Zool., XVIII, p. 754 (♂).

Type locality: Casamance (Chevalier).

13_2. Var. **viridans** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 248 (♂).

Type locality: Kouandé, Upper Dahomey (Desanti).

14. **Ænictus inconspicuus** Westwood, 1847, Trans. Ent. Soc. London, IV, p. 238 (♂), Pl. xiv, fig. 4. F. Smith, 1859, 'Cat. Hym. Brit. Mus.,' VII, p. 10 (♂), Pl. ii, figs. 15a–c. Roger, 1863, 'Verzeich. Formicid.,' p. 41. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 394. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 31 (♂). Arnold, 1915, Ann. South African Mus., XIV, p. 141 (♂).

Type locality: South Africa (Drège).

15. **Ænictus luteus** Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 568 (♂), Pl. xv, figs. 11 and 12. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 8. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 32 (♂). Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 373 (♂).

Type locality: Sierra Leone.

Ivory Coast: Dimbroko (Le Moult).

16. **Ænictus mariæ** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 18 (☿), Pl. ii, figs. 5-7; 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747 (☿); 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 212 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 140 (☿).

Type locality: Makapan, Transvaal (E. Simon).

Rhodesia: Bulawayo (G. Arnold).

16_1. Var. **natalensis** Forel, in Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 49 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Santschi, 1914, Med. Goteborgs Mus. Zool. Afd., III, p. 14 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 141 (☿).

Type locality: Natal (Haviland).

Zululand: Dukudu (I. Trägårdh).

17. **Ænictus möbii** Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 747, fig. NN (♂); 1910, 'Gen. Insect., Dorylinæ,' p. 32 (♂).

Ænictus mœbii Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 269, fig. 6 (♂).

Type locality: Bismarckburg, Togo (Büttner).

Ivory Coast: Dimbroko (Le Moult).

17a. Subsp. **mutatus** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 304, fig. 2 (♂).

Ænictus mœbii var. Santschi, 1910, Rev. Suisse Zool., XVIII, p. 754 (♂).

Ænictus mutatus Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 370, fig. 7 (♂).

Type locality: Ivory Coast (Delafosse).

Ivory Coast: Dimbroko (Le Moult). Dahomey: Kouandé (Desanti).

17*b*. Subsp. **pudicus** (Santschi).

Ænictus mutatus subsp. *pudicus* Santschi, 1919, Rev. Zool. Afr., VI, p. 234 (♂); 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 371, fig. 8 (♂).

Type locality: Dimbroko, Ivory Coast (Le Moult).

17*c*. Subsp. **sankisianus** Forel, 1913, Rev. Zool. Afr., II, p. 312 (♂).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

18. **Ænictus raptor** Forel, 1913, Rev. Zool. Afr., II, p. 314 (♂).

Type locality: Lubumbashi Valley, Belgian Congo (Buttgenbach).

19. **Ænictus rixator** Forel, in Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 48 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 137 (☿).

Type locality: Natal (R. C. Wroughton).

20. **Ænictus rotundatus** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 1 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 112 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 138 (☿), Pl. iv, fig. 37.

Type locality: Port Elizabeth, Cape Province (H. Brauns).

Rhodesia: Bulawayo (G. Arnold).

21. **Ænictus soudanicus** Santschi, 1910, Rev Suisse Zool., XVIII, p. 758, fig. 12 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 304 (☿).

Type locality: Toukola, Sudan (Conan).

Senegambia: St. Louis (Claveau).

21_1. Var. **brunneus** Forel, 1913, Rev. Zool. Afr., II, p. 313 (♂).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

22. **Ænictus steindachneri** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 2 (☿). Emery, 1910, 'Gen. Insect., Dorylinæ,' p. 31 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 69 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 139 (☿).

Type locality: Reddersburg, Orange Free State (H. Brauns).

British East Africa: Mbuyuni, Pori, 1110 m. (Alluaud and Jeannel).

23. **Ænictus togoënsis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 248 (♂); 1920, ibid., LXXXVIII, (1919), p. 375, fig. 12 (♂).

Type locality: Togo.

Ivory Coast: Dimbroko (Le Moult).

24. **Ænictus tuberculatus** Arnold, 1915, Ann. South African Mus., XIV, p. 142 (♂).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

25. **Ænictus weissi** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 354, fig. 2 (☿). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 212 (☿). Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 9 (♀).

Type locality: Gomba, French Congo (A. Weiss).

Cameroon: Grand Batanga (G. Schwab). French Congo: Samkita (F. Faure).

CERAPACHYINÆ Forel

Cerapachyini Forel

Sphinctomyrmex Mayr

Sphinctomyrmex Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 895. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 7.

Cerapachys (part) Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 243.

Genotype: *Sphinctomyrmex stali* Mayr, 1866.

The two following African forms are probably not true members of this genus; being described from the male alone they cannot be properly classified, since no male of the genus is known with certainty.

1. **Sphinctomyrmex rufiventris** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 244, fig. 1 (♂).

Type locality: Djougou, Kouandé, Upper Dahomey (Desanti).

Upper Dahomey: Kika (Ribot). French Sudan: Sikosso (Chevalier).

1a. Subsp. **chariensis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 245 (♂).

Type locality: Fort Archambault, French Equatorial Africa (Decorse).

Cerapachys F. Smith

Cerapachys F. Smith, 1858, Journ. Linn. Soc. London, Zool., II, p. 74. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 8.

Ceratopachys W. A. Schulz, 1906, 'Spolia Hymenopterologica,' p. 155.

Genotype: *Cerapachys antennatus* F. Smith, 1858.

The African species all belong to the subgenus *Cerapachys, sensu stricto*.

1. **Cerapachys afer** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 9 (☿, ♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 9.

Type locality: Mto-ya-Kifaru, Arusha-chini, German East Africa (Katona).

2. **Cerapachys arnoldi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 211 (☿).

Type locality: Cape Colony.

3. **Cerapachys cooperi** Arnold, 1915, Ann. South African Mus., XIV, p. 14 (☿, ♀).

Type locality: Umgeni, Durban, Natal (C. B. Cooper).

4. **Cerapachys cribrinodis** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 24; 1911, 'Gen. Insect., Ponerinæ,' p. 9 (☿). Forel, 1913, Rev. Suisse Zool., XXI, p. 667 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 12 (☿). See p. 53.

Parasyscia cribrinodis Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 463, fig. (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 128 (☿).

Type locality: Cameroon (Conradt).

Cameroon: Johann-Albrechtshöhe (Conradt). Belgian Congo: Medje (Lang and Chapin).

4_1. Var. **natalensis** Forel, 1901, Rev. Suisse Zool., IX, p. 335 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 423 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 9. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 211 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 13 (☿).

Type locality: Natal (Haviland).

Natal: Estcourt (R. C. Wroughton).

5. **Cerapachys peringueyi** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 24; 1911, 'Gen. Insect., Ponerinæ,' p. 9, Pl. i, fig. 2. Arnold, 1915, Ann. South African Mus., XIV, p. 13 (☿), Pl. i, figs. 1, 1a.

Parasyscia peringueyi Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 360 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 17. Emery, 1895, Zool. Jahrb. Abt. Syst., VIII, p. 757, fig. PP (☿, ♀).

Type locality: Cape of Good Hope (L. Péringuey).

Transvaal.

5_1. Var. **latiuscula** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 9. Arnold, 1915, Ann. South African Mus., XIV, p. 14 (☿).

Parasyscia peringueyi var. *latiuscula* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 19 (☿).

Type locality: Makapan, Transvaal (E. Simon).

6. **Cerapachys roberti** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 212 (☿).

Type locality: Estcourt, Natal (R. C. Wroughton).

7. **Cerapachys wroughtoni** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 422 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 9 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 16 (☿).

Type locality: Mountains of Natal (R. C. Wroughton).

7_1. Var. **rhodesiana** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 212 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 16 (☿).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Phyracaces Emery

Phyracaces Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 23; 1911, 'Gen. Insect., Ponerinæ,' p. 10.

Cerapachys (part) Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 243.

Genotype: *Cerapachys mayri* Forel, 1892.

1. **Phyracaces braunsi** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 27 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 11 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 17 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

2. **Phyracaces cooperi** Arnold, 1915, Ann. South African Mus., XIV, p. 18 (☿).

Type locality: Umgeni, Durban, NATAL (C. B. Cooper).

2a. Subsp. **congolensis** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 401 (☿).

Type locality: St. Gabriel, BELGIAN CONGO (Kohl).

3. **Phyracaces foreli** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 309 (☿); 1915, (part) Ann. Soc. Ent. France, LXXXIV, p. 245 (☿), fig. 2*b* (*nec* ♀, fig. 2*a*).

Type locality: Aburi, GOLD COAST (F. Silvestri).

4. **Phyracaces langi** WM. M. WHEELER. See p. 54 (☿, ♀).

Type locality: Lubila, BELGIAN CONGO (Lang and Chapin).

5. **Phyracaces nkomoensis** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 400 (☿).

Type locality: St. Gabriel, BELGIAN CONGO (Kohl).

6. **Phyracaces santschii** WM. M. WHEELER. See p. 56 (♀).

Phyracaces foreli (part) SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 245 (♀), fig. 2*a* (*nec* ☿, fig. 2*b*).

Type locality: Samkita, FRENCH CONGO (F. Faure).

Lioponera MAYR

Lioponera MAYR, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 666. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 11.

Cerapachys subg. *Lioponera* FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 244.

Genotype: *Lioponera longitarsus* Mayr, 1878.

The Ethiopian and North African species being described only from the male, it is very doubtful whether the genus really occurs in those regions.

1. **Lioponera decorsei** SANTSCHI, 1912, Ann. Soc. Ent. Belgique, LVI, p. 150 (♂).

Type locality: Krebedje, southern Darbanda, FRENCH CONGO (Decorse).

2. **Lioponera nigra** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 46 (♂).

Type locality: Molo, Mau Escarpment, 2420 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

PONERINÆ Lepeletier

Cylindromyrmicini Emery

Simopone FOREL

Simopone FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 139. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 15.

Cerapachys subg. *Simopone* FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 249.

Genotype: *Simopone grandidieri* Forel, 1891.

1. **Simopone conradti** EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 475 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 16 (☿), Pl. I, fig. 7.

Type locality: CAMEROON (Conradt).

2. **Simopone marleyi** ARNOLD, 1915, Ann. South African Mus., XIV, p. 20 (☿).

Type locality: Stella Bush, Durban, NATAL (Marley).

Amblyoponini Forel

Mystrium ROGER

Mystrium ROGER, 1862, Berlin. Ent. Zeitschr., VI, p. 245. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 22.

Genotype: *Mystrium mysticum* Roger, 1862.

1. **Mystrium silvestrii** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 310, fig. 1 (☿, ♀).

Type locality: Victoria, CAMEROON (F. Silvestri).

Xymmer (SANTSCHI)

Stigmatomma subg. *Xymmer* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 311.

Genotype: *Stigmatomma* (*Xymmer*) *muticum* Santschi, 1914.

1. **Xymmer muticum** (SANTSCHI).

Stigmatomma (*Xymmer*) *muticum* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 311, fig. 2 (☿).

Type locality: Ibadan, NIGERIA (F. Silvestri).

Platythyreini Emery

Platythyrea ROGER

Platythyrea ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 172. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 28.

Ponera (part) GERSTÆCKER, 1858, Monatsb. Ak. Wiss. Berlin, p. 262.

Pachycondyla (part) F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 108.

Genotype: *Pachycondyla punctata* F. Smith, 1858.

1. **Platythyrea arnoldi** FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 206 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 28 (☿).

Type locality: Shiloh, SOUTHERN RHODESIA (G. Arnold).

2. **Platythyrea conradti** EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 464 (☿, ♂); 1900, Bull. Soc. Ent. Italiana, XXXII, p. 107, fig. 2*a* (♂). FOREL, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 45 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (♂). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿, ♂), Pl. II, figs. 1, 1*b*. FOREL, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 335 (☿, ♂); 1916, Rev. Suisse Zool., XXIV, p. 398 (☿, ♂). See p. 59.

Type locality: CAMEROON (Conradt).

WEST AFRICA: (Fülleborn). FRENCH CONGO: Gaboon (H. Petersen). FERNANDO PO: (Conradt). BELGIAN CONGO: St. Gabriel (Kohl); Risimu (Lang and Chapin).

3. **Platythyrea cooperi** ARNOLD, 1915, Ann. South African Mus., XIV, p. 29 (☿, ♂).

Type locality: Stella Bush, Durban, NATAL (C. B. Cooper).

4. **Platythyrea cribrinodis** (GERSTÆCKER) ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 173; 1863, 'Verzeich. Formicid.,' p. 17. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 442. GERSTÆCKER, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 346 (☿).

Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 270; 1892, ibid., XXXII, p. 111 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 27. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200; 1895, Ann. Naturh. Hofmus. Wien, X, p. 125. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 177; 1896, ibid., XXXVII, p. 154 (☿, ♂); 1897, ibid., XXXVIII, p. 597 (☿, ♂). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 10 (♀, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361 (☿). Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 1 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 208 (♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 47 (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 23 (☿, ♂), Pl. i, fig. 4.

Ponera cribrinodis Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 504 (☿), Pl. xxxii, fig. 3. Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 295.

Type locality: Mozambique (Peters).

Rhodesia: Bulawayo (G. Arnold); Lake Bangweolo (Elena d'Aosta). German East Africa: Lake Tanganyika (Reichardt); Tanga (H. Brauns); Mt. Lettema (Katona); Buiko (Zimmer); Ngare-na-Nyuki, Mt. Meru (Sjöstedt); Kihenga; Korogwe; Mbusini (Stuhlmann); Mt. Ugono. British East Africa: Manda Island; Patta Island (Voeltzkow); Mombasa (v. d. Decken; C. Alluaud); Bura (H. Prell); Nairobi; Masai Plain; Tiwi; Lusinga Island, Victoria Nyanza; Fort Hall, Mt. Kenia, Meranga District (C. Alluaud); Maddo Wells (V. Bottego). Somaliland: Lugh; Matagoi to Lugh (V. Bottego); Mogadiscio; Obbia; Milmil (Bricchetti-Robecchi). Abyssinia: wells of Laffarugh to wells of Aberio, Ogaden (V. Bottego), Kaka, Schoa (Antinori); Salole; Lake Abaja; Bela; Daua (Ruspoli). Uganda: Gondokoro (F. Werner).

4_1. Var. **brevidentata**, new name.

Platythyrea cribrinodis var. *punctata* Arnold, 1915, Ann. South African Mus., XIV, p. 24 (☿); *nec Platythyrea punctata* (F. Smith).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

4_2. Var. **brevinodis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 47 (☿).

Type locality: Samburu, Wa-Nyika District, British East Africa (C. Alluaud).

British East Africa: Mwatate, Wa-Taita District; Kibwezi, Wa-Kamba District (C. Alluaud).

5. **Platythyrea crucheti** Santschi, 1911, Rev. Zool. Afr., I, p. 205 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

6. **Platythyrea frontalis** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 466 (☿, ♀); 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿, ♀).

Type locality: Cameroon (Conradt).

7. **Platythyrea gracillima** Wm. M. Wheeler. See p. 59 (☿).

Type locality: Avakubi, Belgian Congo (Lang and Chapin).

8. **Platythyrea lamellosa** Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 173; 1863, 'Verzeich. Formicid.,' p. 17. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 442. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 27. Mayr, 1895, Ann. Naturh.

Hofmus. Wien, X, p. 125. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 307 (♂). Arnold, 1915, Ann. South African Mus., XIV, p. 25 (☿).

Ponera lamellosa Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 295 (☿).

Sima æthiops var. *grisea* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♂).

Type locality: Cape of Good Hope.

Cape Province: (G. Arnold). Transvaal. Orange Free State: (O. Schneider). Bechuanaland: between Khakhea and Kang (L. Schultze).

8*a*. Subsp. **longinoda** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 75 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 26 (☿).

Type locality: Valdezia, Transvaal (P. Berthoud).

Bechuanaland: Kooa to Sekgoma (L. Schultze).

$8a_1$. Var. **rhodesiana** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 347 (♀). Arnold, 1915, Ann. South African Mus., XIV, p. 27 (☿, ♀, ♂), Pl. i, fig. 3.

Platythyrea lamellosa var. *rhodesiana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110 (☿, ♂).

Type locality: Southern Rhodesia (G. Arnold).

Belgian Congo: Kasongo (Pons).

8*b*. Subsp. **suturalis** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 64 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿).

Type locality: Benguela (C. Wellman).

9. **Platythyrea mocquerysi** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, p. 270 (☿, ♀). See p. 1007.

9_1. Var. **matopoensis** Arnold, 1915, Ann. South African Mus., XIV, p. 32 (♀).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

10. **Platythyrea modesta** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 467 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 398 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp., 1910–11,' I, p. 371 (☿).

Type locality: Cameroon.

Cameroon: Mundame (Conradt). Spanish Guinea: Uelleburg (Tessmann). Belgian Congo: Duma (Schubotz).

11. **Platythyrea occidentalis** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 315 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 27. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (♀, ♂).

Type locality: Sierra Leone (Mocquerys).

French Congo: Ogowe (Mocquerys).

12. **Platythyrea schultzei** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 25 (☿).

Type locality: Salem, German Southwest Africa (L. Schultze).

Southern Rhodesia: Lonely Mine (Swale). German Southwest Africa: Windhoek (L. Schultze).

12_1. Var. **bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 307 (☿, ♂).

Type locality: Nyangwe, Belgian Congo (J. Bequaert).

Belgian Congo: Sankisia (J. Bequaert).

13. **Platythyrea tenuis** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 467 (☿, ♀); 1911, 'Gen. Insect., Ponerinæ,' p. 29 (☿, ♀).

Type locality: Cameroon (Conradt).

14. **Platythyrea viehmeyeri** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 429 (☿).

Type locality: Khutu Steppe, German East Africa (K. Schwartze).

Proceratiini Emery

Sysphincta Roger, *emend.*

Sysphingta Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 175.

Sysphincta Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 12. Emery, 1909, Deutsch. Ent. Zeitschr., p. 359; 1911, 'Gen. Insect., Ponerinæ,' p. 50.

Proceratium (part) Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 437.

Ponera (part) Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 291.

Genotype: *Sysphingta micrommata* Roger, 1863.

1. **Sysphincta arnoldi** (Forel) Arnold, 1915, Ann. South African Mus., XIV, p. 35 (☿).

Proceratium (*Sysphincta*) *arnoldi* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 210 (☿).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Discothyrea Roger

Discothyrea Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 176. Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 51; 1911, 'Gen. Insect., Ponerinæ,' p. 51.

Genotype: *Discothyrea testacea* Roger, 1863.

1. **Discothyrea hewitti** Arnold, 1916, Ann. South African Mus., XIV, p. 160 (☿).

Type locality: Grahamstown, Cape Province (Hewitt).

2. **Discothyrea oculata** Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 52 (☿, ♀, ♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 351 (☿, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 52 (☿, ♀, ♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 312 (☿).

Type locality: Cameroon (L. Conradt).

French Congo: Brazzaville (A. Weiss). French Guinea: Mamou (F. Silvestri).

2a. Var. **sculptior** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 302 (☿).

Type locality: French Congo (A. Weiss).

3. **Discothyrea trægaordhi** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 3 (☿).

Type locality: Pietermaritzburg, Natal (I. Tragårdh).

Probolomyrmex Mayr

Probolomyrmex Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 2. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 52.

Genotype: *Probolomyrmex filiformis* Mayr, 1901.

1. **Probolomyrmex filiformis** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 3 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 52 (☿), Pl. II, figs. 10, 10*b*. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 312 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 34 (☿), Pl. I, figs. 2, 2*a*.

Type locality: Port Elizabeth, Cape Province (H. Brauns).

French Guinea: Kakoulima (F. Silvestri).

Escherichia Forel

Escherichia Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 245. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 53.

Genotype: *Escherichia brevirostris* Forel, 1910.

1. **Escherichia brevirostris** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 246 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 53 (☿).

Type locality: Ghinda, Eritrea (K. Escherich).

Pseudosphincta Arnold

Pseudosphincta Arnold, 1916, Ann. South African Mus., XIV, p. 161.

Genotype: *Pseudosphincta poweri* Arnold, 1916.

1. **Pseudosphincta poweri** Arnold, 1916, Ann. South African Mus., XIV, p. 162, figs. 9, 9a (☿).

Type locality: Kimberley, Cape Province (Power).

Ponerini Forel

Centromyrmex Mayr

Centromyrmex Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 894. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 57.

Spalacomyrmex Emery, 1889, Ann. Mus. Civ. Genova, XXVII, p. 489.

Ponera (part) Roger, 1861, Berlin. Ent. Zeitschr., V, p. 5.

Genotype: *Centromyrmex bohemani* Mayr, 1866.

1. **Centromyrmex constanciæ** Arnold, 1915, Ann. South African Mus., XIV, p. 38 (☿, ♀), Pl. II, figs. 14, 14a, 14*b*, 14*c*.

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Bembesi (G. Arnold).

1_1. Var. **arnoldi** (Santschi).

Centromyrmex arnoldi Santschi, 1919, Rev. Zool. Afr., VI, p. 229, fig. (☿, ♂).

Centromyrmex constantiæ var. *arnoldi* Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 8.

Type locality: Amatongas Forest, Portuguese East Africa (G. Arnold).

2. **Centromyrmex sellaris** Mayr, 1896, Ent. Tidskr., XVII, p. 230 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 58 (☿).

Type locality: Cameroon (Sjöstedt).

2_1. Var. **longiventris** Santschi, 1919, Rev. Zool. Afr., VI, p. 229 (☿).

Centromyrmex sellaris Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 313 (☿) (*nec* Mayr).

Type locality: Victoria, Cameroon (F. Silvestri).

Streblognathus Mayr

Streblognathus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 716. Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 468; 1911, 'Gen. Insect., Ponerinæ,' p. 61.

Ponera (part) F. Smith, Roger.

Genotype: *Ponera æthiopica* F. Smith, 1858.

1. **Streblognathus æthiopicus** (F. Smith) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 716 (☿), Pl. xix, figs. 10 and 11; 1863, ibid., XIII, p. 454. Roger, 1863, 'Verzeich. Formicid.,' p. 19. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 31. R. T. Lewis, 1896, Journ. Quekett Micr. Club, (2) VI, p. 274, Pl. xii, figs. 1–8 (☿). Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 468 (♂); 1900, Bull. Soc. Ent. Italiana, XXXII, p. 105, fig. 1 (♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 61 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 3 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 41 (☿, ♂), Pl. i, fig. 5.

Ponera æthiopica F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 91 (☿), Pl. vi, figs. 19, 20. Roger, 1861, Berlin. Ent. Zeitschr., V, p. 11 (☿).

Type locality: South Africa.

Basutoland. Natal: Van Reenen (I. Trägårdh); Durban (Wilms; v. Stuckrad); Richmond (J. R. Ward). Cape Province: Willowmore (H. Brauns); Uitenhage. Transvaal: (Heinemann).

Paltothyreus Mayr

Paltothyreus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 735; 1866, ibid., XVI, p. 894. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 62.

Formica (part) Fabricius. *Ponera* (part) Guérin, F. Smith, Roger.

Pachycondyla (part) F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 105.

Genotype: *Formica tarsata* Fabricius, 1798.

1. **Paltothyreus tarsatus** (Fabricius) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 736. Roger, 1863, 'Verzeich. Formicid.,' p. 17. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 440; 1866, ibid., XVI, p. 894 (♂), Pl. xx, fig. 6. Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 136 (☿, ♀, ♂). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 557 (☿, ♀, ♂); 1892, Ann. Mus. Civ. Genova, XXXII, p. 111 (☿). Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 32. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200. H. Stadelmann, 1893, Mitth. Deutsch. Schutzgeb., VI, p. 217. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74. Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 112 (☿). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 126 (☿, ♀, ♂). Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 177. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (☿, ♀). Mayr, 1896, Ent. Tidskr., XVII, p. 231. Emery, 1896, Ann. Mus. Civ. Genova, XXXVII, p. 115 (☿, ♀, ♂); 1897, ibid., XXXVIII, p. 597. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41. A. v. Schulthess, 1899, Bull. Soc. Vaudoise Sc. Nat., (5) XXXV, p. 253 (♀). Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500 (☿, ♀, ♂); 1900, Bull. Soc. Ent. Italiana, XXXII, p. 112, fig. 5 (☿, ♀). Sjöstedt, 1904, 'I Vastafrikas Urskogar,' p. 210. Schonland, 1904, Trans. Ent. Soc. London, Proc., p.

xl. Zavattari, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 548, p. 2 (♀); 1907, ibid., XXII, No. 550, p. 2 (♀). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 354 and 357. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 8. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 75 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (☿, ♀) and p. 64 (♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350 (☿, ♀). Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 213 (♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿, ♀, ♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 377 (☿, ♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 62 (☿), Pl. II, fig. 14; 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 1 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 308 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 347 (☿, ♀, ♂); 1913, Rev. Suisse Zool., XXI, p. 666 (☿, ♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 313 (☿, ♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 47 (☿, ♀); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 4 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 44 (☿, ♀, ♂), Pl. I, figs. 6 and 10. Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. (1910–11),' I, p. 371 (☿). Santschi, 1919, Rev. Zool. Afr., VII, pp. 79 and 81 (☿, ♀, ♂). Carpenter, 1920, 'A Naturalist on Lake Victoria,' pp. 50 and 281. See p. 61.

Formica tarsata Fabricius, 1798, 'Suppl. Ent. Syst.,' p. 280 (☿); 1804, 'Syst. Piez.,' p. 408 (☿).

Ponera tarsata Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 194 (☿). Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 310; 1861, ibid., V, p. 166.

Ponera gagates Guérin, 1845, 'Iconogr. Règne Anim.,' VII, Insect., p. 423 (☿). Fairmaire, in J. Thomson, 1858, 'Archives Entomologiques,' II, p. 263. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 90.

Ponera pestilentia F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 92 (☿).

Ponera spiniventris F. Smith, 1858, ibid., p. 92 (♂).

Pachycondyla simillima F. Smith, 1858, ibid., p. 105 (♀), Pl. VII, fig. 17. Roger, 1863, 'Verzeich. Formicid.,' p. 18.

Paltothyreus pestilentia A. Girard, in Capello and Ivens, 1882, 'From Benguella to the Territory of Yacca,' II, p. 294. M. L. Sykes, 1900, Trans. Manchester Microsc. Soc., XX, (1899), p. 90. W. F. Kirby, 1900, Proc. Zool. Soc. London, p. 47.

Paltothyreus pestelentia Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 198. A. Girard, ibid., p. 227.

Paltothyreus ? simillima Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 358.

Type locality: Gorée Island, Senegambia.

Senegambia: Dakar (C. Alluaud); Thiès (F. Silvestri). Casamance: (Claveau). Portuguese Guinea: Bissis Island (Lucas). French Guinea: Los Islands (C. Alluaud), Konakry; Kakoulima; Kindia (F. Silvestri). Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Ivory Coast: Dimbroko (Le Moult); Jacqueville; Grand Bassam (Lohier); Assinie (C. Alluaud). Gold Coast: Akra. Togo: Bismarckburg (Conradt; Büttner). Cameroon: (Sjöstedt; F. Silvestri; Conradt); Mundame (Conradt); Bibundi (Tessmann). Spanish Guinea: Alen (Tessmann). French Congo: Ogowe (Mocquerys); Fort Crampel (Le Moult); Brazzaville. Belgian Congo: Kwesi to Kilo (Bayer); Kondué (Luja); Kiniati; Eala (R.

Mayné); Mayombe (Deleval); village of Denge, Niangara (Hutterau); Katanga (Lemaire); Ikelemba (Kinsberger); Boga; Beni; Avakubi; Ubangi District (Schubotz); Kindu (Grauer); Lake Leopold II (Leyder); Garamba, Yakuluku, Stanleyville; Medje; Risimu; Leopoldville; Bafwasende; Faradje; Gamangui; Bafwabaka; Niangara, Niapu; Ngayu; Akenge; Avakubi (Lang and Chapin). ANGOLA: (Welwitsch). BENGUELA: (C. Wellman). GERMAN SOUTHWEST AFRICA: (Lubbert); Okahandja (Peters); Omaheke (Trotha). RHODESIA: Luapula River (Elena d'Aosta); Bulawayo, Bembesi; Victoria Falls; Matoppo Hills (G. Arnold); Kazungula (Jallá). CAPE PROVINCE: Willowmore (H. Brauns). NATAL: Stamford Hill (I. Trägårdh); Port Natal (H. Brauns). ZULULAND: (Marley). PORTUGUESE EAST AFRICA: Delagoa (Liengme); Inhambane (Fornasini). GERMAN EAST AFRICA: Tanga; Rosako, Usaramo (Stuhlmann); Buiko; Monga (H. Prell); Amani (Zimmer); Mombo, Usambara (Sjöstedt); Lake Tanganyika (Reichardt). ZANZIBAR: (Voeltzkow). BRITISH EAST AFRICA: Patta Island (Voeltzkow); Shimoni; Mbuyuni, Pori; Kisumu, Victoria Nyanza; Nyangnori, western Nandi (Alluaud and Jeannel); Mombasa (H. Prell). UGANDA: Buzubizi (Alluaud and Jeannel); Butiti; Ibanda (Duke of Abruzzi). SOMALILAND: (C. Keller); Bularli (Peel); Merca (Taramasso); Mogadiscio; Obbia; Ellah-laj, Uorandi; Las Ej (Bricchetti-Robecchi); Hargeisa (V. Bottego). ABYSSINIA: Buditu to Dimé; Arussi Galla (V. Bottego); Webi (Bricchetti-Robecchi); Ogaden; Daua (Ruspoli).

Has been recorded from Madagascar, but undoubtedly through an error.

1_1. Var. **medianus** SANTSCHI, 1919, Rev. Zool. Afr., VII, pp. 80 and 82 (☿, ♀, ♂).

Type locality: Brazzaville, FRENCH CONGO (A. Weiss).

CAMEROON: Molundu (Reichensperger). FRENCH CONGO: Ubangi (Augustin); Borda (Charleux). BENGUELA: Cucala (J. Cruchet).

1_2. Var. **subopacus** SANTSCHI, 1919, Rev. Zool. Afr., VII, pp. 80 and 82 (☿, ♀).

Type locality: Samkita, FRENCH CONGO (F. Faure).

1a. Subsp. **delagoensis** (EMERY) SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 48 (☿, ♀).

Paltothyreus tarsatus var. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 126.

Paltothyreus tarsatus var. *delagoensis* EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 468 (☿, ♀); 1911, 'Gen. Insect., Ponerinæ,' p. 62 (☿, ♀). ARNOLD, 1915, Ann. South African Mus., XIV, p. 45 (☿). SANTSCHI, 1919, Rev. Zool. Afr., VII, pp. 80 and 82 (☿).

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA.

RHODESIA: (G. Arnold). GERMAN EAST AFRICA: Mt. Kilimanjaro, River Himo (C. Alluaud); Pangani (Reichensperger). BRITISH EAST AFRICA: Mt. Kenia, Meranga, Fort Hall; Bura, Wa-Taita; Kibwezi, Wa-Kamba; Mombasa; Maji-ya-chumvi, Wa-Nyika; Samburu, Wa-Nyika (Alluaud and Jeannel).

$1a_1$. Var. **robustus** (SANTSCHI).

Paltothyreus tarsatus var. *robusta* SANTSCHI, 1919, Rev. Zool. Afr., VII, pp. 81 and 82 (☿, ♀).

Type locality: Buarsangueli, SOMALILAND (Revoil).

$1a_2$. Var. **striatidens** (SANTSCHI).

Paltothyreus tarsatus var. *striatidens* SANTSCHI, 1919, Rev. Zool. Afr., VII, pp. 81 and 82 (☿, ♀).

Type locality: Kibwezi, BRITISH EAST AFRICA (C. Alluaud).

Glyphopone Forel

Glyphopone Forel, 1913, Rev. Zool. Afr., II, p. 308.

Genotype: *Glyphopone bequaerti* Forel, 1913.

1. **Glyphopone bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 308, fig. 1 (♀); 1913, Ann. Soc. Ent. Belgïque, LVII, p. 347 (♀). Bequaert, 1913, Rev. Zool. Afr., II, p. 422.

Type locality: Kibombo, Belgian Congo (J. Bequaert).

Belgian Congo: Kasongo (Pons).

Leptopone (Arnold)

Glyphopone subg. *Leptopone* Arnold, 1916, Ann. South African Mus., XIV, p. 163.

Genotype: *Glyphopone (Leptopone) rufigaster* Arnold, 1916.

1. **Leptopone rufigaster** (Arnold).

Glyphopone (Leptopone) rufigaster Arnold, 1916, Ann. South African Mus., XIV, p. 163, figs. 10, 10a (♀).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

Megaponera Mayr

Megaponera Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 734. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 67.

Megaloponera Roger, 1863, 'Verzeich. Formicid.,' p. 17.

Ponera (part) Guérin, Gerstæcker, Roger. *Formica* (part) Fabricius, Latreille.

Genotype: *Formica fœtens* Fabricius, 1793.

1. **Megaponera fœtens** (Fabricius) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 735 (☿); 1863, ibid., XIII, p. 428. Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 538 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 30. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200; 1895, Ann. Naturh. Hofmus. Wien, X, p. 125. Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 597 (☿, ♂). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41. Gestro, 1901, Ann. Mus. Civ. Genova, XL, p. 729. Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 377 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 68 (☿); 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 1 (☿). Arnold, 1913, Proc. Rhodesia Sc. Assoc., XII, p. 12; 1914, ibid., XIII, p. 26. H. Brauns, 1914, ibid., XIII, pp. 33, 35, 39, and 42. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 48 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 313 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 46, fig. 6 (☿, ♀, ♂), Pl. i, figs. 7, 8, and 8a. Poulton, 1915, Trans. Ent. Soc. London, pp. v–vii and lvi–lxi. Bickhardt, 1916, Entom. Blätter, XII, p. 2. Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 371 (☿, ♂). Carpenter, 1918, Trans. Ent. Soc. London, (1917), Proc., p. lx; 1920, 'A Naturalist on Lake Victoria,' p. 282. **See p. 64.**

Formica fœtens Fabricius, 1793, 'Ent. Syst.,' II, p. 354 (☿); 1804, 'Syst. Piez.,' p. 401 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32.

Formica analis Latreille, 1802, 'Hist. Nat. Fourmis,' p. 282 (☿).

Ponera abyssinica Guérin, in Lefebvre, 1848, 'Voy. Abyssinie,' IV, Zool., part 6, p. 352 (☿), Pl. vii, fig. 6. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 90. Radoszkowsky, 1876, Hor. Soc. Ent. Rossicæ, XII, p. 140. Cannaviello, 1900, Bull. Soc. Ent. Italiana, XXXII, p. 297.

Ponera læviuscula Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 505 (☿), Pl. xxxii, fig. 4.

Ponera fœtens Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262; 1859, Arch. f. Naturg., XXV, 2, p. 431. Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 310 (☿). Gerstæcker, 1862, in Peters, 'Reise n. Mossambique, Zool.,' V, p. 504 (☿).

Megaloponera fœtens Roger, 1863, 'Verzeich. Formicid.,' p. 17. Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 368. Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 197. Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿); 1894, ibid., IX, p. 75. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 177; 1899, ibid., XXXIX, p. 500 (♂). Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 369 (☿, ♂); 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 9 (☿, ♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 64 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 244 (☿). Prell, 1911, Zool. Anzeiger, XXXVIII, p. 244, fig. 1. Forel, 1911, Rev. Zool. Afr., I, p. 274 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, pp. 108 (☿) and 347 (☿, ♂); 1913, Rev. Zool. Afr., II, p. 308 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 206. J. Bequaert, 1913, Rev. Zool. Afr., II, p. 422 (☿).

Ponera crassicornis Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿); 1862, in Peters, 'Reise n. Mossambique, Zool.,' V, p. 506 (☿), Pl. xxxii, fig. 5. Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 309; 1863, 'Verzeich. Formicid.,' p. 23. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 448.

Megaponera crassicornis Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 200. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 30. Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 597 (☿). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41.

Megaloponera crassicornis Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 368 (☿). Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿).

Megaponera dohrni Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 30 (☿).

Type locality: Guinea (Isert).

Senegambia: Thiès (F. Silvestri). Sierra Leone: (F. Silvestri). Gold Coast: Akropong (Imhoff). Togo: (H. Brauns); Bismarckburg (Conradt). Southern Nigeria: Agege; Ibadan (Farquharson). Cameroon: Metit (G. Schwab). French Congo: Fort de Possel; Fort Crampel (Schubotz). Belgian Congo: Lukula (Daniel); Kondué (Luja); Kambove (S. A. Neave); Malela; Sankisia (J. Bequaert); Kwesi to Kilo (Bayer); Kindu (Burgeon); Kwidjwi Island, Lake Kivu; Libenge (Schubotz), Zambi; Niangara; Rungu, Avakubi; Faradje; Panga to Banalia; Boyulu; Niapu; Garamba; Akenge; Gamangui (Lang and Chapin). Angola: (Welwitsch). Benguela: (C. Wellman). Rhodesia: Mumbwa (Dollman); Leangwa Valley (S. A. Neave); Bulawayo (G. Arnold); Luapula River (Elena d'Aosta). Portuguese East Africa: Tete; Mozambique (Peters). German East Africa: Mt. Kilimanjaro (Bornemisza); Moschi (Katona); Njussi

(H. Prell); Amani, near Buiko (Zimmer); Mbusini; Bondei (Stuhlmann); Kibonoto, Mt. Kilimanjaro (Sjostedt); Itigi; Kyaka Fort on the Kagera River (G. D. H. Carpenter); Usambara. Zanzibar. British East Africa: Pori of Serengeti between Bura and Taveta; Fort Hall; Mbuyuni (Alluaud and Jeannel). Uganda: Unyoro Province, Lake Albert (C. Alluaud); Gondokoro (F. Werner). Abyssinia: Arussi Galla, Ganale Gudda; Sancurar to Amarr Burgi; Dimé to Bass Narok (V. Bottego); Sciotel (Beccari); Daua; Ogaden; Degabolla; Lake Abaja; Brava (Ruspoli); Gogfale; Harar (Kachovskij); southern Abyssinia (Ilg); Adua; Makalle. Somaliland: (C. Keller); Lower Ganana (V. Bottego). Eritrea: Keren (Beccari; Magretti); Bogos (Antinori); Ghinda (K. Escherich). Anglo-Egyptian Sudan: Sennar.

1_1. Var. **rapax** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 49 (☿).

Type locality: New Moschi, Mt. Kilimanjaro, 800 m., German East Africa (Alluaud and Jeannel).

German East Africa: Moschi and Kilema, 1400–1500 m. (Alluaud and Jeannel).

Ophthalmopone Forel

Ophthalmopone Forel, 1890, Ann. Soc. Ent. Belgique, XXXIV, C. R., p. cxi. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 69.

Pachycondyla (part) Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 360.

Genotype: *Ophthalmopone berthoudi* Forel, 1890.

1. **Ophthalmopone berthoudi** Forel, 1890, Ann. Soc. Ent. Belgique, XXXIV, C. R., p. cxii (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 31. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 76 (☿, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 69 (☿, ♂). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 108 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 50 (☿, ♂), Pl. iii, figs. 11, 13.

Type locality: Valdezia, Transvaal (P. Berthoud).

Southern Rhodesia: Bulawayo (G. Arnold). Portuguese East Africa: Delagoa (Liengme).

2. **Ophthalmopone depilis** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 29 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 69 (☿).

Type locality: San Thomé (Mocquerys).

3. **Ophthalmopone hottentota** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 30; 1911, 'Gen. Insect., Ponerinæ,' p. 70 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 52 (☿, ♂), Pl. ii, fig. 12.

Pachycondyla hottentota Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 360 (☿); 1890, Ann. Soc. Ent. France, (6) X, p. 72 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 34.

Ophthalmopone lanceolata Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 125 (☿).

Type locality: Cape of Good Hope (L. Péringuey).

Southern Rhodesia: Sebakwe (G. Arnold). Cape Province: generally (G. Arnold); Willowmore (H. Brauns).

4. **Ophthalmopone ilgi** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 76 (☿). Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 597 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 70 (☿).

Type locality: Southern Abyssinia (Ilg).

Somaliland: (Ruspoli).

5. **Ophthalmopone mocquerysi** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 29 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 422 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 70 (☿).

Type locality: San Thomé (Mocquerys).

Angola: Mossamedes.

Bothroponera Mayr

Bothroponera Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 717.

Pachycondyla subg. *Bothroponera* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 75. Forel, Arnold, Santschi.

Pachycondyla (part) F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 105.

Ponera (part) Jerdon, F. Smith, Roger.

Genotype: *Bothroponera pumicosa* Roger, 1860.

1. **Bothroponera cariosa** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 20 (☿).

Pachycondyla (*Bothroponera*) *cariosa* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 59 (☿).

Type locality: Delagoa Bay, Portuguese East Africa.

Cape Province. Transvaal.

2. **Bothroponera cavernosa** (Roger) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 717; 1863, ibid., XIII, p. 397. Roger, 1863, 'Verzeich. Formicid.,' p. 16. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36.

Ponera cavernosa Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 288 (☿).

Pachycondyla (*Bothroponera*) *cavernosa* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 76. Arnold, 1915, Ann. South African Mus., XIV, p. 60 (☿).

Type locality: Caffraria.

Cape Province.

3. **Bothroponera crassa** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 111 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 75. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 2 (☿).

Ponera crassa Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 366, fig. (☿).

Ponera (*Bothroponera*) *crassa* Emery, 1895, ibid., XXXV, p. 177.

Pachycondyla (*Bothroponera*) *crassa* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 244 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 77 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 347 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 50 (☿).

Type locality: Sciotel, Abyssinia (Beccari).

French Congo: Ogowe (Mocquerys). Belgian Congo: Mayombe (de Briey). British East Africa: Nairobi (C. Alluaud). Eritrea: Nefasit (Ilg). Abyssinia: (Ilg); Arussi Galla, Ganale Gudda; Wells of Laffarugh to Wells of Aberio, Ogaden (V. Bottego); Webi (Bricchetti-Robecchi). Somaliland: Obbia (Bricchetti-Robecchi); Erdal.

3_1. Var. **ilgi** (Forel).

Pachycondyla (*Bothroponera*) *crassa* var. *ilgi* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 244 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 77 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 50 (☿).

Type locality: Schoa, Abyssinia (Ilg).

British East Africa: Kenia Region between the Amboni and Naremuru Rivers, 1800–2000 m. (Alluaud and Jeannel).

4. **Bothroponera cribrata** (Santschi).

Pachycondyla (*Bothroponera*) *cribrata* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 349 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

5. **Bothroponera fugax** (Forel).

Pachycondyla (*Bothroponera*) *fugax* Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 7 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿).

Type locality: Arusha-chini, Lake Djipe, German East Africa (Katona).

6. **Bothroponera granosa** (Roger) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 717; 1863, ibid., XIII, p. 397. Roger, 1863, 'Verzeich. Formicid.,' p. 16. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36.

Ponera granosa Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 290 (☿).

Pachycondyla (*Bothroponera*) *granosa* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 61 (☿), Pl. II, fig. 16.

Type locality: Cape of Good Hope (Drège).

Cape Province: George, Knysna (H. Brauns). Natal. Southern Rhodesia: Victoria Falls (L. Péringuey).

7. **Bothroponera krügeri** (Forel).

Pachycondyla (*Bothroponera*) *krügeri* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 28 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 56 (☿).

Pachycondyla (*Bothroponera*) *kruegeri* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 77 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 4 (☿). Trägårdh, ibid., p. 43.

Type locality: Valdezia, Transvaal (P. Berthoud).

Zululand: Umfolosi (I. Trägårdh). Transvaal: (G. Arnold).

7_1. Var. **rhodesiana** (Forel).

Pachycondyla (*Bothroponera*) *krügeri* var. *rhodesiana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 109 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 57 (☿, ♂).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

7a. Subsp. **asina** (Santschi).

Pachycondyla (*Bothroponera*) *asina* Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 153 (☿).

Pachycondyla (*Bothroponera*) *kruegeri* subsp. *asina* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 4 (☿).

Type locality: British East Africa (Demarchi).

Zululand: Umfolosi (I. Trägårdh).

8. **Bothroponera lævissima** (Arnold).

Pachycondyla (*Bothroponera*) *lævissima* ARNOLD, 1915, Ann. South African Mus., XIV, p. 58 (☿), Pl. II, figs. 15, 15*a*.

Type locality: Saldanha Bay, CAPE PROVINCE (G. Arnold).

9. **Bothroponera nasica** (SANTSCHI).

Pachycondyla (*Bothroponera*) *nasica* SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 6 (♀).

Type locality : Samkita, FRENCH CONGO (F. Faure).

10. **Bothroponera pachyderma** (EMERY). See p. 73.

Pachycondyla (*Bothroponera*) *pachyderma* EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 49 (☿, ♀). MAYR, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 9 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿, ♀).

Type locality: CAMEROON (Conradt).

GERMAN EAST AFRICA: Kibonoto, Mt. Kilimanjaro, 1000–2000 m.; Natron Lakes (Sjöstedt). BELGIAN CONGO: Manamana; Bafwasende; Medje; Ngayu; Niapu; Niangara; Akenge (Lang and Chapin).

10_1. Var. **attenata** (SANTSCHI).

Pachycondyla (*Bothroponera*) *pachyderma* var. *attenata* SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 7 (☿).

Type locality: N'gazi, BELGIAN CONGO (Elskens).

10_2. Var. **funerea** WM. M. WHEELER. See p. 73 (♀).

Type locality: Medje, BELGIAN CONGO (Lang and Chapin).

10_3. Var. **postsquamosa** (SANTSCHI).

Pachycondyla (*Bothroponera*) *pachyderma* var. *postsquamosa* SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 7 (☿).

Type locality: Lobay, FRENCH CONGO (Riggenbach).

11. **Bothroponera picardi** (FOREL).

Pachycondyla (*Bothroponera*) *picardi* FOREL, 1901, Mitth. Schweiz. Ent. Ges., X, p. 304 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 559 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 77 (☿).

Type locality: between the Cubango and Cuito Rivers, MOSSAMEDES (Baum and Van der Kellen).

12. **Bothroponera pumicosa** (ROGER) MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 717; 1863, ibid., XIII, p. 397. ROGER, 1863, 'Verzeich. Formicid.,' p. 16. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 36.

Ponera pumicosa ROGER, 1860, Berlin. Ent. Zeitschr., IV, p. 290 (☿).

Pachycondyla pumicosa FOREL, 1901, Rev. Suisse Zool., IX, p. 344.

Pachycondyla (*Bothroponera*) *pumicosa* EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45. STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿). FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿). SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 4 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 62 (☿, ♂).

Type locality: Caffraria.

CAMEROON: Mundame (Conradt). CAPE PROVINCE: (H. Brauns; Drège); Cape Town (Wilms). NATAL: (Haviland); Van Reenen (I. Trägårdh).

12_1. Var. **berthoudi** (FOREL).

Pachycondyla berthoudi FOREL, 1901, Rev. Suisse Zool., IX, p. 344 (☿).

Pachycondyla (*Bothroponera*) *berthoudi* EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿). FOREL, 1913, Rev. Zool. Afr., II, p. 306 (☿, ♂).

Pachycondyla (Bothroponera) pumicosa subsp. *berthoudi* FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 109 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 63 (☿, ♂).

Type locality: Valdezia, TRANSVAAL (P. Berthoud).

CAPE PROVINCE: Willowmore (H. Brauns).

12_4. Var. **sculpturata** (SANTSCHI).

Pachycondyla (Bothroponera) sculpturata SANTSCHI, 1912, Ann. Soc. Ent. Belgique, LVI, p. 151 (♀).

Type locality: Zambésie, RHODESIA (Demarchi).

MOZAMBIQUE: (G. Vasse).

13. **Bothroponera sanguinea** (SANTSCHI).

Pachycondyla (Bothroponera) sanguinea SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 7 (☿).

Type locality: CONGO (obtained from Le Moult).

14. **Bothroponera silvestrii** (SANTSCHI).

Pachycondyla (Bothroponera) silvestrii SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 313 (☿).

Type locality: Aburi, GOLD COAST (F. Silvestri).

15. **Bothroponera sjöstedti** (MAYR). See p. 74.

Ponera sjöstedti MAYR, 1896, Ent. Tidskr., XVII, p. 231 (☿, ♀, ♂).

Pachycondyla (Bothroponera) sjöstedti EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 77 (☿, ♀, ♂).

Pachycondyla (Bothroponera) sjæstedti SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 315, fig. 3 (♀).

Type locality: CAMEROON (Sjöstedt).

CAMEROON: Victoria (F. Silvestri); Mbalmajo to Ekeneli (G. Schwab). BELGIAN CONGO: Malela (J. Bequaert).

16. **Bothroponera soror** (EMERY). See p. 74.

Ponera (Bothroponera) soror EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 472 (☿, ♀).

Pachycondyla (Bothroponera) soror EMERY, 1901, ibid., XLV, p. 46. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350 (☿). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿, ♀). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 78 (☿, ♀). FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110 (☿); 1913, Rev. Zool. Afr., II, p. 306 (♀). ARNOLD, 1915, Ann. South African Mus., XIV, p. 59 (☿).

Pachycondyla soror BEQUAERT, 1913, Rev. Zool. Afr., II, p. 421.

Type locality: CAMEROON (Conradt).

TOGO: Bismarckburg (Conradt). CAMEROON: Metit (G. Schwab); Mundame (Conradt); Yaunde (Zenker). FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Elisabethville; Sankisia (J. Bequaert); Akenge; Medje; Ngayu; Niangara; Avakubi; Niapu (Lang and Chapin). RHODESIA: Springvale; Bulawayo (G. Arnold).

16_1. Var. **ancilla** (EMERY). See p. 74.

Ponera (Bothroponera) soror var. *ancilla* EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 472 (☿).

Pachycondyla (Bothroponera) soror var. *ancilla* EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, 'Gen. Insect., Ponerinæ,' p. 78 (☿).

Type locality: River Kuilu, FRENCH CONGO.

Belgian Congo: Isangi (Lang and Chapin).

16a. Subsp. **suturalis** (Forel).

Pachycondyla (Bothroponera) soror subsp. *suturalis* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 133 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 78 (☿).

Type locality: Karssa, Abyssinia (de Rothschild).

17. **Bothroponera strigulosa** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 19 (☿).

Pachycondyla (Bothroponera) strigulosa Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 61 (☿).

Type locality: Kimberley, Cape Province (E. Simon).

18. **Bothroponera talpa** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 316 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 37. See p. 73.

Ponera (Bothroponera) talpa Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 473 (☿).

Pachycondyla (Bothroponera) talpa Emery, 1901, ibid., XLV, p. 45. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 314 (♀).

Type locality: Sierra Leone (Mocquerys).

French Guinea: Kakoulima (F. Silvestri). Gold Coast: Aburi (F. Silvestri). Cameroon. Belgian Congo: Niapu; Niangara, Avakubi; Medje (Lang and Chapin).

18a. Subsp. **variolata** (Santschi).

Pachycondyla (Bothroponera) variolata Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 151 (☿).

Pachycondyla (Bothroponera) talpa subsp. *variolata* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 314.

Type locality: French Congo (Zimmermann).

Phrynoponera Wm. M. Wheeler

Phrynoponera Wm. M. Wheeler, 1920, Psyche, XXVII, p. 53.

Genotype: *Bothroponera gabonensis* Ern. André, 1892.

1. **Phrynoponera armata** (Santschi).

Pachycondyla (Bothroponera) armata Santschi, 1919, Rev. Zool. Afr., VII, p. 82 (☿).

Type locality: Kitempuka, Belgian Congo (Gérard).

2. **Phrynoponera bequaerti** Wm. M. Wheeler. See p. 79 (♀).

Type locality: Ngayu, Belgian Congo (Lang and Chapin).

3. **Phrynoponera gabonensis** (Ern. André). See p. 76.

Bothroponera gabonensis Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 50 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36.

Pachycondyla (Bothroponera) gabonensis Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130, fig. 1 (☿, ♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 76 (☿).

Type locality: Gaboon, French Congo.

Belgian Congo: Kimpoko (Buttner); Bafwasende; Medje; Akenge (Lang and Chapin).

3_1. Var. **esta** Wm. M. Wheeler. See p. 77 (☿, ♀).

Type locality: Medje, Belgian Congo (Lang and Chapin).

Belgian Congo: Gamangui; Ngayu (Lang and Chapin).

3_2. Var. **fecunda** Wm. M. Wheeler. See p. 78 (☿, ♀).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

Belgian Congo: Medje; Ngayu; Avakubi (Lang and Chapin).

3_3. Var. **robustior** (Santschi).

Pachycondyla (*Bothroponera*) *gabonensis* var. *robustior* Santschi, 1919, Rev. Zool. Afr., VII, p. 82 (☿).

Type locality: Banalia, Belgian Congo (J. Bequaert).

3_4. Var. **striatidens** (Santschi). See p. 78.

Pachycondyla (*Bothroponera*) *gabonensis* var. *striatidens* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 315, fig. 4 (☿).

Type locality: Victoria, Cameroon (F. Silvestri).

Belgian Congo: Medje; Akenge; Ngayu (Lang and Chapin).

3_5. Var. **umbrosa** Wm. M. Wheeler. See p. 78 (☿).

Type locality: Medje, Belgian Congo (Lang and Chapin).

4. **Phrynoponera heterodus** Wm. M. Wheeler. See p. 78 (♀).

Type locality: Stanleyville, Belgian Congo (Lang and Chapin).

5. **Phrynoponera sveni** (Forel). See p. 79.

Pachycondyla (*Bothroponera*) *sveni* Forel, 1916, Rev. Suisse Zool., XXIV, p. 398 (☿).

Type locality: Belgian Congo (Kohl).

Belgian Congo: Medje (Lang and Chapin).

Ectomomyrmex Mayr

Ectomomyrmex Mayr, 1867, Tijdschr. v. Ent., X, p. 83.

Pachycondyla subg. *Ectomomyrmex* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Pachycondyla (part) F. Smith. *Bothroponera* (part) Emery, Forel. *Ponera* (part) Ern. André, Forel.

Genotype: *Ectomomyrmex javanus* Mayr, 1867.

1. **Ectomomyrmex brunoi** (Forel).

Pachycondyla (*Ectomomyrmex*) *brunoi* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 205 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 53 (☿, ♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

Euponera Forel

Ponera subg. *Euponera* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 126 (*sensu stricto*).

Euponera Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 43 (*sensu latiore*). Forel, 1901, ibid., XLV, p. 141. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 79.

Ponera (part) F. Smith, Roger, Mayr, etc. *Formica* (part) Fabricius.

Genotype: *Euponera sikoræ* Forel, 1891.

Subgenus 1. **Mesoponera** Emery

Euponera subg. *Mesoponera* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 43; 1911, 'Gen. Insect., Ponerinæ,' p. 80.

Mesoponera Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 99.

Ponera subg. *Xiphopelta* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 108 (misspelled *Hiphopelta* on the same page).

Euponera subg. *Xiphopelta* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 206.

Pachycondyla (part) Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 890.

Ponera (part) F. Smith, Roger, Mayr, etc.

Subgenotype: *Ponera caffraria* F. Smith, 1858.

1. **Euponera (Mesoponera) caffraria** (F. Smith) Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, 'Gen. Insect., Ponerinæ,' p. 81 (☿, ♀). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 108 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 65 (☿, ♀, ♂), Pl. II, figs. 17, 17a and Pl. III, fig. 22.

Ponera caffraria F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 91 (♀). Roger, 1860, Berlin. Ent. Zeitschr., IV, p. 285; 1863, 'Verzeich. Formicid.,' p. 16. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 447; 1886, ibid., XXXVI, p. 358. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 38. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 124 (☿, ♀). Emery, 1899, Mem. Accad. Sc. Bologna, (5) VIII, p. 3 (larva), Pl. I, fig. 2.

Ponera guineensis Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 318 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 39. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 20.

Mesoponera caffraria Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 332 and 342 (♀).

Euponera (Brachyponera) caffraria Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350.

Euponera (Mesoponera) caffra Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 315 (☿).

Type locality: Port Natal, Natal.

French Guinea: Kakoulima (F. Silvestri). Sierra Leone: (Mocquerys). Cameroon: (H. Brauns). French Congo: Brazzaville (A. Weiss). Rhodesia: Springvale (G. Arnold). Bechuanaland: Serui (Dixey and Longstaff). Transvaal: Pretoria (E. Simon). Natal: (C. B. Cooper and Marley); Colenso (Dixey and Longstaff). Cape Province: Willowmore (H. Brauns).

2. **Euponera (Mesoponera) elisæ** (Forel). See p. 1008.

2_1. Var. **redbankensis** (Forel).

Ponera (Xiphopelta) arnoldi var. *redbankensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 109 (☿).

Euponera (Mesoponera) eliza var. *redbankensis* Arnold, 1915, Ann. South African Mus., XIV, p. 71 (☿).

Type locality: Redbank, Rhodesia (G. Arnold).

2*a*. Subsp. **divaricata** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 6, fig. 3 (☿).

Type locality: Keren, Eritrea (F. Silvestri).

Eritrea: Ghinda; Nefasit (F. Silvestri).

2*b*. Subsp. **rotundata** (Emery) Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 206 (☿).

Ponera elisæ var. *rotundata* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 20 (☿).

Euponera (Mesoponera) elisæ var. *rotundata* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, 'Gen. Insect., Ponerinæ,' p. 81 (☿).

Euponera (Mesoponera) elizæ var. *rotundata* Arnold, 1915, Ann. South African Mus., XIV, p. 70 (☿, ♀).

Ponera (Xiphopelta) arnoldi Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 108 (☿).

Type locality: Bloemfontein, Orange Free State (E. Simon).

Rhodesia: Bulawayo (G. Arnold).

3. **Euponera (Mesoponera) escherichi** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (☿).

Pachycondyla (Bothroponera) escherichi Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 244 (☿).

Euponera (Mesoponera?) escherichi, Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 82.

Type locality: Nefasit, Eritrea (K. Escherich; F. Silvestri).

4. **Euponera (Mesoponera) fossigera** Mayr. Arnold, 1915, Ann. South African Mus., XIV, p. 71 (☿), Pl. ii, fig. 20.

Euponera fossigera Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 3 (☿).

Euponera (Mesoponera?) fossigera Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 82.

Type locality: Port Elizabeth, Cape Province (H. Brauns).

5. **Euponera (Mesoponera) havilandi** (Forel).

Megaloponera (Hagensia) havilandi Forel, 1901, Rev. Suisse Zool., IX, p. 333 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿).

Megaponera (Hagensia) havilandi Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 69 (☿).

Euponera (Mesoponera) sulcigera Mayr, 1904, Verh. Zool. Bot. Ges. Wien, LIV, p. 593 (☿).

Euponera havilandi Arnold, 1915, Ann. South African Mus., XIV, p. 67 (☿, ♂).

Type locality: Natal (Haviland; R. C. Wroughton).

Natal: Durban (Wilms). Cape Province: Knysna (H. Brauns)[1]; Grahamstown (Hewitt); King William's Town (R. Godfrey).

5_1. Var. **fochi** Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155.

Type locality: Durban, Natal.

6. **Euponera (Mesoponera) ingesta** Wm. M. Wheeler. See p. 82 (☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

Belgian Congo: Niapu; Faradje; Lubila (Lang and Chapin).

7. **Euponera (Mesoponera) peringueyi** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 81. Arnold, 1915, Ann. South African Mus., XIV, p. 66 (☿), Pl. ii, fig. 19.

Ponera peringueyi Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 474 (☿).

Euponera (Brachyponera) peringueyi Emery, 1901, ibid., XLV, p. 47.

Type locality: Nord Hook, Cape Province (L. Péringuey).

Cape Province: Saldanha Bay (L. Péringuey).

8. **Euponera (Mesoponera) scolopax** Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, 'Gen. Insect., Ponerinæ,' p. 81. Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 371 (☿).

Ponera scolopax Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 473 (☿).

Type locality: Cameroon (Conradt).

Belgian Congo: Libenge (Schubotz).

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[1] Specimens received from Dr. H. Brauns.

9. **Euponera (Mesoponera) senegalensis** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 315, fig. 5 (☿).

Euponera (Xiphopelta) senegalensis Emery, 1915, ibid., X, p. 7.

Type locality: Thiès, Senegambia (F. Silvestri).

10. **Euponera (Mesoponera) subiridescens** Wm. M. Wheeler. See p. 83 (☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

Belgian Congo: Medje; Ngayu (Lang and Chapin).

Subgenus 2. **Brachyponera** Emery

Euponera subg. *Brachyponera* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 43; 1911, 'Gen. Insect., Ponerinæ,' p. 83.

Brachyponera Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 101.

Pachycondyla (part) Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 316.

Ponera (part) Roger, Mayr, F. Smith, Emery, Forel.

Subgenotype: *Ponera sennaarensis* Mayr, 1862.

11. **Euponera (Brachyponera) ambigua** (Ern. André) Emery, 1901, Ann. Soc. Ent. Belgique, XLV, pp. 47 and 49; 1911, 'Gen. Insect., Ponerinæ,' p. 84.

Pachycondyla ambigua Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 316 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 32.

Type locality: Sierra Leone (Mocquerys).

12. **Euponera (Brachyponera) sennaarensis** (Mayr) Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 47. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 75 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 5 (☿). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350 (☿, ♀). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 245 (☿, ♀, ♂). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿). Forel, 1911, Rev. Zool. Afr., II, p. 307 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 3 (☿, ♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 84 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 108 (☿, ♀) and 347 (☿, ♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 50 (☿, ♀); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 318. Arnold, 1915, Ann. South African Mus., XIV, p. 72 (☿, ♀, ♂), Pl. ii, fig. 21. Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (☿, ♀). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 372 (☿). See p. 84.

Ponera sennaarensis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 721 (☿); 1863, ibid., XIII, p. 450. Roger, 1863, 'Verzeich. Formicid.,' p. 16. Mayr, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 662 (☿). Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 366 (☿). Magretti, 1884, ibid., XXI, p. 338 (☿). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 557 (☿); 1881, Ann. Mus. Civ. Genova, XVI, p. 528; 1892, ibid., XXXII, p. 111 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 42. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 75. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 125. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1895, Ann. Mus. Civ. Genova, XXXV, p. 177; 1897, ibid., XXXVIII, p. 597; 1899, Ann. Soc. Ent. Belgique, XLIII, p. 474.

Ponera sorghi Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 169 (☿); 1863, 'Verzeich. Formicid.,' p. 16. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 450.

Ponera senaarensis Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿). Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 202 and 221.

?*Ponera sennaarensis* Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 474.

Euponera sennaarensis Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 2. Bequaert, 1913, Rev. Zool. Afr., II, p. 421. Arnold, 1913, Proc. Rhodesia Sc. Assoc., XII, p. 13.

Euponera (*Brachyponera*) *sorghi* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 84 (☿).

Type locality: Sennar, Anglo-Egyptian Sudan.

Senegambia: Dakar (C. Alluaud); Thiès (F. Silvestri). French Guinea: Konakry; Kindia; Kakoulima (F. Silvestri). Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Gold Coast: Kitta; Akra. Southern Nigeria: Ibadan; Olokemeji (F. Silvestri). Cameroon: Metit; Mbalmajo to Ekeneli (G. Schwab). Spanish Guinea: Alen (Tessmann). French Congo: Cape Lopez; Brazzaville; Mindouli (A. Weiss); Fort Crampel (Schubotz). Belgian Congo: Leopoldville (J. Maes); Avakubi; Niapu; Stanleyville; Medje; Faradje; Thysville; Zambi (Lang and Chapin); Bukama (J. Bequaert). Rhodesia: Bulawayo (G. Arnold). Uganda: Unyoro Province, region of Lake Albert, Kadjura (C. Alluaud); Gondokoro (F. Werner). British East Africa: Voi, Taita district (Alluaud and Jeannel). German East Africa: Pemba Island; Fundu Island (Voeltzkow). Somaliland: Lower Ganana (V. Bottego); Obbia; Mogadiscio; Gubbet-(Bricchetti-Robecchi). Abyssinia: Bela; Ogaden (Ruspoli); Sciotel (Beccari); southern Abyssinia (Ilg); Webi (Bricchetti-Robecchi). Eritrea: Kor Lebka (Magretti); Nefasit; Ghinda (K. Escherich); Keren; Ghinda (F. Silvestri). Anglo-Egyptian Sudan: Khartum (I. Trägårdh; Karawaiew); White Nile (Gredler); Kassala; Bahr-el-Salaam (Magretti). Arabia: Mascat (Biro); Aden; Tes; Cheik Isman (Doria and Beccari).

12_1. Var. **ruginota** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 372 (☿).

Type locality: Yaunde, Cameroon (v. Sommerfeld).

Subgenus 3. **Trachymesopus** Emery

Euponera subg. *Trachymesopus* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 84.

Pachycondyla subg. *Pseudoponera* (part) Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 42.

Euponera subg. *Pseudoponera* (part) Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 141.

Pseudoponera (part) Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 91.

Subgenotype: *Formica stigma* Fabricius, 1804.

13. **Euponera** (**Trachymesopus**) **darwini** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 86. See p. 1009.

Belonopelta darwini Forel, 1893, Ann. Soc. Ent. Belgique, XXXVII, p. 460 (♀).

Type locality: Port Darwin, Australia.

13_1. Var. **africana** Forel. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 86. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 318 (♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 51 (♀). See p. 85.

Euponera (*Pseudoponera*) *darwini* var. *africana* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (♀).

Type locality: Luki, BELGIAN CONGO (A. Jullien).

SOUTHERN NIGERIA: Lagos (F. Silvestri). BRITISH EAST AFRICA: Taveta (Alluaud and Jeannel). BELGIAN CONGO: Stanleyville (Lang and Chapin).

14. **Euponera (Trachymesopus) lamarki** SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 303 (♀).

Type locality: Southern Darbanda, FRENCH CONGO (Decorse).

15. **Euponera (Trachymesopus) nigeriensis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 316 (☿).

Type locality: Olokemeji, NIGERIA (F. Silvestri).

GOLD COAST: Aburi (F. Silvestri).

16. **Euponera (Trachymesopus) suspecta** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 51, fig. 1 (☿).

Type locality: New Moschi, Mt. Kilimanjaro, 800 m., GERMAN EAST AFRICA (Alluaud and Jeannel).

17. **Euponera (Trachymesopus) wroughtoni** FOREL. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 85 (☿, ♂). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 52 (♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 75 (☿, ♂), Pl. II, fig. 18.

Euponera (Pseudoponera) wroughtoni FOREL, 1901, Rev. Suisse Zool., IX, p. 341 (☿, ♂).

Type locality: NATAL (R. C. Wroughton).

CAPE PROVINCE: Knysna (H. Brauns). BRITISH EAST AFRICA: Voi, Wa-Taita District (C. Alluaud); Tiwi (Alluaud and Jeannel).

17_1. Var. **crudelis** FOREL. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 85 (☿, ♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 76 (☿, ♂).

Euponera (Pseudoponera) wroughtoni var. *crudelis* FOREL, 1901, Rev. Suisse Zool., IX, p. 341 (☿, ♂).

Type locality: NATAL (Haviland).

Pseudoponera EMERY

Pachycondyla subg. *Pseudoponera* (part) EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 42.

Pseudoponera EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 86.

Genotype: *Ponera amblyops* Emery, 1887.

Subgenus **Promyopias** SANTSCHI

Myopias subg. *Promyopias* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 323.

Promyopias EMERY, 1915, ibid., X, p. 26.

Subgenotype: *Myopias (Promyopias) silvestrii* Santschi, 1914.

1. **Pseudoponera (Promyopias) asili** (CRAWLEY).

Promyopias asili CRAWLEY, 1916, Entomologist, XLIX, p. 30, fig. (♀).

Type locality: NYASALAND (S. A. Neave).

2. **Pseudoponera (Promyopias) silvestrii** (SANTSCHI).

Myopias (Promyopias) silvestrii SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 324, fig. 10 (☿).

Promyopias silvestrii EMERY, 1915, ibid., X, p. 26, fig. 13*b* (☿)

Type locality: Mamou, FRENCH CONGO (F. Silvestri).

Cryptopone EMERY

Cryptopone EMERY, 1892, Ann. Soc. Ent. France, LXI, C. R., p. cclxxv; 1911, 'Gen. Insect., Ponerinæ,' p. 88.

?*Amblyopone* (part) MOTSCHULSKY, 1863, Bull. Soc. Nat. Moscou, XXXVI, p. 15.

Genotype: *Amblyopone* (?) *testacea* Motschulsky, 1863.

1. **Cryptopone angustata** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 319, fig. 7 (☿).

Type locality: Kakoulima, FRENCH GUINEA (F. Silvestri).

Ponera LATREILLE[1]

Ponera LATREILLE, 1805, 'Hist. Nat. Crust. Ins.,' XIII, p. 257. EMERY, 1901, Ann. Soc. Ent. Belgique, XLV, p. 41; 1911, 'Gen. Insect., Ponerinæ,' p. 88.

Ponera (part) LATREILLE, 1809, 'Gen. Crust. Ins.,' IV, p. 128.

Formica (part) LATREILLE, 1802, 'Hist. Nat. Fourmis,' p. 195.

Bothroponera (part) FOREL, 1900, Journ. Bombay Nat. Hist. Soc., XIII, p. 322.

Genotype: *Formica coarctata* Latreille, 1802.

1. **Ponera abeillei** ERN. ANDRÉ, 1881, Ann. Soc. Ent. France, (6) I, C. R., p. xlviii (☿).

Type locality: Ajaccio, CORSICA.

1₁. Var. **cammerunensis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 321 (☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

2. **Ponera coarctata** (LATREILLE) DALLA TORRE, 1892, Wien. Ent. Zeitg., XI, p. 93.

Formica coarctata LATREILLE, 1802, Bull. Soc. Philomath. Paris, III, p. 65 (☿, ♀), Pl. III, fig. 1.

Type locality: "Jardin du Luxembourg, près de Gentilly," FRANCE (Latreille).

The typical form is found in Southern Europe (northward to Paris), the Mediterranean subregion and the Caucasus.

2a. Subsp. **boerorum** FOREL, 1901, Rev. Suisse Zool., IX, p. 339 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 90 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 83 (☿).

Type locality: NATAL, 1600 m. (Haviland).

GERMAN EAST AFRICA: Kibosho (Katona).

2a₁. Var. **æmula** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 53 (☿).

Ponera dulcis var. *æmula* SANTSCHI, 1910, Ann. Soc. Ent. France, LXXIX, p. 351 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 90 (☿).

Type locality: Kibosho, Mt. Kilimanjaro, 1400 m., GERMAN EAST AFRICA (C. Alluaud).

GERMAN EAST AFRICA: Tanga, cave C (C. Alluaud).

2*b*. Subsp. **natalensis** SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 7 (☿),

Type locality: Richmond, NATAL (I. Trägårdh).

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[1] *Ponera denticulata* F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 90 (♀), Pl. VI, figs. 13 and 14, was described by error from the "Cape of Good Hope." It is a synonym of the Malayan *Odontoponera transversa* (F. Smith).

3. **Ponera cœca** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 322, fig. 9 (☿, ♀). Forel, 1916, Rev. Suisse Zool., XXIV, p. 397 (♀).

Type locality: Victoria, Cameroon (F. Silvestri).

Belgian Congo: St. Gabriel (Kohl).

4. **Ponera dideroti** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿, ♀, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 78 (☿, ♀, ♂).

Type locality: Knysna, Cape Province (H. Brauns).

5. **Ponera dulcis** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 245 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 90 (☿). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 213 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 53, fig. 2 (☿). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 366. Arnold, 1915, Ann. South African Mus., XIV, p. 82 (☿, ♀).

Type locality: Arusha-chini, German East Africa (Katona).

Natal: Durban (Marley). Rhodesia: Bulawayo (G. Arnold). German East Africa: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). British East Africa: Cave A, Shimoni (C. Alluaud). Eritrea: Nefasit (K. Escherich).

5$_1$. Var. **uncta** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 7 (☿).

Type locality: Dukudu, Zululand (I. Trägårdh).

6. **Ponera ergatandria** Forel, 1893, Trans. Ent. Soc. London, p. 365 (☿, ♀, ♂). Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 44. Wheeler, 1908, Bull. American Mus. Nat. Hist., XXIV, p. 125 (☿, ♀, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 92. Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 154. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 213 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 53 (☿).

Type locality: St. Vincent, West Indies (H. Smith).

Canary Islands: Teneriffe. Natal: Durban (Marley). British East Africa: Shimoni (Alluaud and Jeannel).

Tropicopolitan; introduced in hothouses of temperate regions.

6a. Subsp. **cognata** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 153 (☿). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 81 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

Rhodesia: Bulawayo (G. Arnold).

6b. Subsp. **petri** Forel, 1916, Rev. Suisse Zool., XXIV, p. 397 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

7. **Ponera gleadowi** Forel, in Emery, 1895, Mem. Accad. Sc. Bologna, (5) V, p. 292, footnote (☿).

Type locality: Poona, India (R. C. Wroughton).

7a. Subsp. **æthiopica** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 132 (♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91. Arnold, 1915, Ann. South African Mus., XIV, p. 83 (☿).

Type locality: Tchafianani, southern Abyssinia (de Rothschild).

Cape Province: Willowmore (H. Brauns).

8. **Ponera inaudax** Santschi, 1919, Rev. Zool. Afr., VII, p. 83 (☿).

Type locality: Yambuya, Belgian Congo (J. Bequaert).

9. **Ponera incisa** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 320, fig. 8 (☿).

Type locality: Lagos, SOUTHERN NIGERIA (F. Silvestri).

10. **Ponera myrmicariæ** WASMANN, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 144 (☿).

Type locality: Soppo, CAMEROON (v. Rothkirch).

11. **Ponera orba** EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 7, fig. 4 (☿).

Type locality: Ghinda, ERITREA (F. Silvestri).

12. **Ponera punctatissima** (part?) ROGER, 1859, Berlin. Ent. Zeitschr., III, p. 246 (☿, ♀). FOREL, 1874, 'Fourmis de la Suisse,' pp. 64, 66 (☿, ♀, ♂). ERN. ANDRÉ, 1882, 'Spec. Hym. Europ. Algérie,' II, pp. 241, 242, 245 (☿, ♀, ♂), Pl. XIV, figs. 15, 16. EMERY, 1895, Mem. Accad. Sc. Bologna, (5) V, p. 294, figs. 9, 10 (☿, ♀); 1901, Ann. Soc. Ent. Belgique, XLV, p. 44; 1909, Deutsch. Ent. Zeitschr., p. 373, fig. 11 (☿, ♀, ♂); 1911, 'Gen. Insect., Ponerinæ,' p. 91, Pl. III, fig. 5. SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 320 (☿). See p. 1009.

Ponera androgyna ROGER, 1859, Berlin. Ent. Zeitschr., III, p. 254, footnote (♂).

Ponera contracta (part) MEINERT, 1860, Danske Vidensk. Selsk. Skrift., naturv. math. Afd., (5) V, p. 322 (☿; *nec* ♀, ♂).

Ponera tarda CHARLALEY, 1877, Ent. Monthly Mag., XIV, p. 162.

Type locality: Rauden, GERMANY (in hothouses).

FRENCH GUINEA: Konakry (F. Silvestri). NIGERIA: Olokemeji; Lagos (F. Silvestri).

13. **Ponera ragusæ** EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 91. See p. 1010.

Ponera ragusai EMERY, 1894, Il Naturalista Siciliano, XIV, p. 28 (☿); 1895, Mem. Accad. Sc. Bologna, (5) V, pp. 292, 297, fig. 18 (☿); 1901, Ann. Soc. Ent. Belgique, XLV, p. 44. FOREL, 1907, Ann. Mus. Nat. Hungarici, V, p. 2 (☿). SANTSCHI, 1908, Ann. Soc. Ent. France, LXXVII, p. 519 (♀, ♂). EMERY, 1909, Deutsch. Ent. Zeitschr., p. 370, fig. 9a (☿).

Type locality: SICILY (Ragusa).

EGYPT: Cairo (Borcard). GERMAN EAST AFRICA: Boma Gombe (Katona).

13_1. Var. **sordida** (SANTSCHI).

Ponera ragusai var. *sordida* SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 54 (☿).

Type locality: Shimoni, BRITISH EAST AFRICA (Alluaud and Jeannel).

13a. Subsp. **bulawayensis** (FOREL) ARNOLD, 1915, Ann. South African Mus., XIV, p. 80 (☿).

Ponera ragusai subsp. *bulawayensis* FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

14. **Ponera rothkirchi** WASMANN, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 145 (☿).

Type locality: Soppo, CAMEROON (v. Rothkirch).

15. **Ponera spei** FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 423 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 92 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 77 (☿).

Type locality: Mountains of NATAL (R. C. Wroughton).

CAPE PROVINCE: Algoa Bay (H. Brauns).

15*a*. Subsp. **devota** Santschi, 1913, Med. Göteborgs Mus. Zool. Afd., III, p. 5 (☿).

Type locality: Richmond, Natal (I. Trägårdh).

15*a*₁. Var. **sancta** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 213 (☿).

Type locality: Durban, Natal (G. Arnold).

16. **Ponera sulcatinasis** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 4 (☿, ♀).

Type locality: Richmond, Natal (I. Trägårdh).

16a. Subsp. **durbanensis** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 213 (☿).

Type locality: Durban, Natal (G. Arnold).

17. **Ponera trægaordhi** Santschi, 1914. Med. Göteborgs Mus. Zool. Afd., III, p. 6 (☿).

Type locality: Pietermaritzburg, Natal (I. Trägårdh).

Asphinctopone Santschi

Asphinctopone Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 318.

Genotype: *Asphinctopone silvestrii* Santschi, 1914.

1. **Asphinctopone silvestrii** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 318, fig. 6 (☿).

Type locality: Olokemeji, Nigeria (F. Silvestri).

Plectroctena F. Smith

Plectroctena F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 101. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 94.

Formica (part) Spinola, 1853, Mem. Accad. Sc. Torino, XIII, p. 79.

Genotype: *Plectroctena mandibularis* F. Smith, 1858.

1. **Plectroctena cristata** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 470 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 95 (☿). See p. 88.

Type locality: Cameroon (Conradt).

Togo: (Conradt; Schröder). Cameroon: Mundame (Conradt); Barombi (Preuss). Fernando Po: (Conradt). Belgian Congo: Medje; Akenge (Lang and Chapin).

2. **Plectroctena gabonensis** Santschi, 1919, Bull. Soc. Vaudoise Sci. Nat., (5) LII, p. 336 (☿).

Type locality: Libreville, French Congo (Chalot).

French Congo: Samkita (F. Faure).

3. **Plectroctena mandibularis** F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 101 (☿, ♂), Pl. vii, figs. 1–5. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355, 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 346. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 19. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 124. Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 469 (♀ erg.). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 18. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 95 (☿, ♂), Pl. iii, fig. 7; 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 2 (☿). Forel, 1913, Ann. Soc. Ent.

Belgique, LVII, p. 108 (☿); 1913, Rev. Zool. Afr., II, p. 308 (☿); 1913, Rev. Suisse Zool., XXI, p. 666 (☿). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 54 (☿, ♂). ARNOLD, 1915, Ann. South African Mus., XIV, p. 86 (☿, ♀ erg., ♂).

Ponera caffra (KLUG) SPINOLA, 1853, Mem. Accad. Sc. Torino, XIII, p. 69 (without description). EMERY, 1893, Boll. Mus. Zool. Anat. Comp. Torino, VIII, No. 163, p. 2.

Plectroctena caffra ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 41 (☿, ♀, ♂); 1863, 'Verzeich. Formicid.,' p. 19. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 442. EMERY, 1891, Ann. Soc. Ent. France, LX, p. 556 (☿), Pl. xv, figs. 3, 4. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 31. FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74. DIXEY and LONGSTAFF, 1907, Trans. Ent. Soc. London, p. 336. ZAVATTARI, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 213 (♂). FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 3 (☿, ♂); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361 (☿).

Plectroctena caffra subsp. *major* FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74 (♀ erg.).

Plectrotena caffra H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41.

Plectroctena mandibularis var. *major* EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 95. SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 8 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 54 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 86 (☿, ♀ erg., ♂).

Type locality: Port Natal, NATAL (Gueinzius).

CAMEROON: (Conradt). BELGIAN CONGO: Katanga (Lemaire); valley of the Lubumbashi (Buttgenbach). RHODESIA: Bulawayo (G. Arnold); Luapula River (Elena d'Aosta). GERMAN SOUTHWEST AFRICA: (Lübbert). KALAHARI Desert (L. Schultze). ORANGE FREE STATE. CAPE PROVINCE: Cape Town (Wilms); Mafeking (L. Schultze). NATAL: Durban (Wilms). TRANSVAAL: Makapan (E. Simon); Valdezia (Creux and P. Berthoud); Johannesburg (Dixey and Longstaff). ZULULAND: Umfelosi (I. Trägårdh). DELAGOA: (P. Berthoud). GERMAN EAST AFRICA: Kibonoto, Kilimanjaro (Sjöstedt); Lake Tanganyika (Reichardt); Moschi, Mt. Kilimanjaro, 1120 m. (Alluaud and Jeannel). BRITISH EAST AFRICA: Wanga (v. d. Decken); Nairobi (H. Prell); Fort Hall; Nairobi; Bura, Wa-Taita; River Tchania (Alluaud and Jeannel); Samburu, Wa-Nyika District (C. Alluaud). UGANDA: Ibanda (Duke of Abruzzi).

3_1. Var. **strigosa** EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 469 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 95 (☿). FOREL, 1912, Ent. Mitt. Deutsch. Ent. Mus. Berlin, I, p. 81 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 88 (☿).

Type locality: NATAL.

Changmane, Africa.

4. **Plectroctena minor** EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 556 (♀), Pl. xv, figs. 1, 2. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 31. EMERY, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 32 (☿, ♀); 1911, 'Gen. Insect., Ponerinæ,' p. 95 (☿, ♀). SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 325. FOREL, 1916, Rev. Suisse Zool., XXIV, p. 398 (☿, ♀). See p. 88 (♀ ergat., ♂).

Type locality: Assinie, IVORY COAST (C. Alluaud).

Sierra Leone. Gold Coast: Aburi (F. Silvestri). Cameroon: Victoria (F. Silvestri). Fernando Po: (Conradt). Belgian Congo: St. Gabriel (Kohl); Akenge; Stanleyville; Niapu (Lang and Chapin).

4_1. Var. **dentata** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 150; 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 54 (☿).

Plectroctena minor Santschi, 1911, Rev. Zool. Afr., I, p. 205 (☿).

Type locality: Benguela (J. Cruchet).

Uganda: Ibanda, Mt. Ruwenzori, 1400 m. (C. Alluaud).

4a. Subsp. **conjugata** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 8 (☿).

Type locality: Stamford Hill, Natal (I. Trägårdh).

Natal: Charlestown (I. Trägårdh). Zululand: (I. Trägårdh).

Myopias Roger

Myopias Roger, 1861, Berlin. Ent. Zeitschr., V, p. 39.

Genotype: *Myopias amblyops* Roger, 1861.

1. **Myopias subterranea** (Arnold).

Plectroctena subterranea Arnold, 1915, Ann. South African Mus., XIV, p. 84 (☿, ♀), Pl. III, figs. 23, 23a.

Type locality: Bulawayo, Rhodesia (G. Arnold).

Rhodesia: Shiloh (G. Arnold).

1a. Subsp. **gabonensis** (Santschi).

Plectroctena subterranea subsp. *gabonensis* Santschi, 1919, Rev. Zool. Afr., VII, p. 90 (☿).

Type locality: Gaboon, French Congo (F. Faure).

Psalidomyrmex Ern. André

Psalidomyrmex Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 313. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 95.

Genotype: *Psalidomyrmex foveolatus* Ern. André, 1890.

1. **Psalidomyrmex foveolatus** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 314 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 31. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 96 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 325 (☿).

Type locality: Sierra Leone (Mocquerys).

French Guinea: Kakoulima (F. Silvestri). Cameroon: (Conradt); Bibundi (Tessmann).

2. **Psalidomyrmex longiscapus** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 8 (♀).

Type locality: Samkita, French Congo (F. Faure).

3. **Psalidomyrmex obesus** Wm. M. Wheeler. See p. 92 (☿).

Type locality: Medje, Belgian Congo (Lang and Chapin).

4. **Psalidomyrmex procerus** Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 50 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 129 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 96, Pl. III, fig. 8. See p. 90.

Psalidomyrmex foveolatus Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 471 (♀, ♂) (nec André).

Type locality: Cameroon (Conradt).

TOGO: Bismarckburg (Conradt). CAMEROON: Mundame (Conradt). BELGIAN CONGO: Medje; Akenge; Niapu (Lang and Chapin).

5. **Psalidomyrmex reichenspergeri** SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 302 (☿); 1914, Deutsch. Ent. Zeitschr., p. 288 (♂). See p. 90.

Type locality: Molundu, CAMEROON (Reichensperger).

CAMEROON: Soppo (v. Rothkirch). BELGIAN CONGO: Akenge (Lang and Chapin).

Cacopone SANTSCHI

Cacopone SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 325.

Genotype: *Cacopone hastifer* Santschi, 1914.

1. **Cacopone hastifer** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 325, fig. 11 (☿).

Type locality: Aburi, GOLD COAST (F. Silvestri).

Leptogenyini Forel

Leptogenys ROGER

Leptogenys ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 41 (*sensu stricto*).

Leptogenys MAYR, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 198 (*sensu latiore*). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 97.

Lobopelta MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 733.

Ponera (part) JERDON, F. SMITH, ROGER, BUCKLEY.

Genotype: *Leptogenys falcigera* Roger, 1861.

Subgenus 1. **Leptogenys** ROGER, *sensu stricto*[1]

Subgenotype: same as genotype.

1. **Leptogenys bellii** EMERY, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 59 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 99 (☿).

Type locality: Ghinda, ERITREA (Belli).

2. **Leptogenys conradti** FOREL, 1913, Rev. Suisse Zool., XXI, p. 666 (☿).

Type locality: CAMEROON (Conradt).

3. **Leptogenys cribrata** EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 20 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 99 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 91 (☿).

Type locality: Vrijburg, CAPE PROVINCE (E. Simon).

4. **Leptogenys crustosa** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 326, fig. 12 (☿).

Type locality: Konakry, FRENCH GUINEA (F. Silvestri).

5. **Leptogenys ferrarii** FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 209 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 94 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

5a. Subsp. **dentatula** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 246 (☿).

Type locality: Kataki, BELGIAN CONGO (Gérard).

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[1] According to Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 81, *Leptogenys pruinosa* Forel, originally described from Ceylon, was found at Hamburg in wood imported from East Africa.

6. **Leptogenys jeanneli** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 55, fig. 3 (☿). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 375.

Type locality: Cave B, Kulumuzi, Tanga, German East Africa (Alluaud and Jeannel).

7. **Leptogenys longiceps** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 328, fig. 13 (☿).

Type locality: Dakar, Senegambia (F. Silvestri).

8. **Leptogenys maxillosa** (F. Smith) Roger, 1861, Berlin. Ent. Zeitschr., V, p. 43 (☿); 1863, 'Verzeich. Formicid.,' p. 19. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 426; 1886, ibid., XXXVI, p. 358. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 46. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 89 (☿, ♂), Pl. iii, fig. 24. See p. 1011.

Ponera maxillosa F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 93 (☿, ♂).

Type locality: Mauritius (Beke).

Rhodesia: Bulawayo (G. Arnold). Malagasy Region. West Indies: St. Thomas.

9. **Leptogenys pavesii** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 111 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 46. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 55 (☿). Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., pp. liv and lv.

Type locality: Obbia, Somaliland (Bricchetti-Robecchi).

British East Africa: Shimoni (Alluaud and Jeannel); Voi (Alluaud). Somaliland: Erdal (Pavesi). German East Africa: Lindi (Lamborn).

10. **Leptogenys schwabi** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 208 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 93 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

11. **Leptogenys stuhlmanni** Mayr. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 100 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 55 (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 91 (☿). Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., p. lv.

Leptogenys (Lobopelta) stuhlmanni Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 198 (☿).

Type locality: Quilimane, Mozambique (Stuhlmann).

Natal: Durban (G. Arnold). British East Africa: Mombasa (C. Alluaud); Shimoni; Tiwi; Likoni; Cheteni (Alluaud and Jeannel). North East Africa: (von Erlanger). German East Africa: Lindi (Lamborn).

11a. Subsp. **camerunensis** (Stitz) Forel, 1916, Rev. Suisse Zool., XXIV, p. 400.

Leptogenys camerunensis Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 421. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99 (☿).

Type locality: Barombi, Cameroon (Preuss).

11a_1. Var. **angusticeps** Forel, 1916, Rev. Suisse Zool., XXIV, p. 399 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

11a_2. Var. **opalescens** Wm. M. Wheeler. See p. 94 (☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

11*b*. Subsp. **erythræa** Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 33 (☿). Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 131 (☿, ♂); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 247 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 100 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 92 (♂).

Leptogenys stuhlmanni Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 60 (☿) (*nec* Mayr).

Type locality: Ghinda, Eritrea (Belli).

Eritrea: Nefasit (K. Escherich). Abyssinia: Bourka (de Rothschild).

Subgenus 2. **Lobopelta** (Mayr)

Lobopelta Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 733.

Leptogenys subg. *Lobopelta* Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 101.

Subgenotype: *Ponera diminuta* F. Smith, 1857.

12. **Leptogenys (Lobopelta) arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110 (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 99 (☿, ♀, ♂), Pl. III, figs. 27, 27a, and 28.

Type locality: Plumtree, Rhodesia (G. Arnold).

13. **Leptogenys (Lobopelta) attenuata** (F. Smith) Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 124 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 97 (☿, ♂).

Ponera attenuata F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 91 (☿). Roger, 1861, Berlin. Ent. Zeitschr., V, p. 14 (☿). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 447. Emery, 1893, Boll. Mus. Zool. Anat. Comp. Torino, VIII, No. 163, p. 2.

Lobopelta? attenuata Roger, 1863, 'Verzeich. Formicid.,' p. 19.

Lobopelta attenuata Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 43.

Type locality: Cape of Good Hope.

Cape Province: Algoa Bay (H. Brauns). Natal: Durban (C. B. Cooper). Portuguese East Africa: Delagoa Bay.

13$_1$. Var. **jægerskiœldi** (Santschi).

Leptogenys (Lobopelta) jægerskiœldi Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 9 (☿).

Leptogenys (Lobopelta) attenuata var. *jägerskiöldi* Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 279.

Type locality: Richmond, Natal (I. Trägårdh).

14. **Leptogenys (Lobopelta) buyssoni** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 131 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿).

Type locality: Hićka Bourka, southern Abyssinia (de Rothschild).

15. **Leptogenys (Lobopelta) castanea** (Mayr) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 101 (☿).

Lobopelta castanea Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 734 (☿); 1863, ibid., XIII, p. 427. Roger, 1863, 'Verzeich. Formicid.,' p. 19. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 72 (☿), Pl. III, fig. 20; 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 664 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 44.

Leptogenys castanea Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 20 (☿).

Type locality: Cape of Good Hope (Novara Expedition).

Cape Province: Algoa Bay (H. Brauns). Transvaal: Makapan (E. Simon).

16. **Leptogenys (Lobopelta) ergatogyna** Wm. M. Wheeler. See p. 95 (♀).

Type locality: Medje, Belgian Congo (Lang and Chapin).

17. **Leptogenys (Lobopelta) guineensis** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 329, fig. 14 (☿).

Type locality: French Guinea (F. Silvestri).

18. **Leptogenys (Lobopelta) havilandi** Forel, 1901, Rev. Suisse Zool., IX, p. 332 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 96 (☿).

Type locality: Natal (Haviland).

18a. Subsp. **peringueyi** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 210 (☿).

Leptogenys (Lobopelta) peringueyi Arnold, 1915, Ann. South African Mus., XIV, p. 96 (☿).

Type locality: Table Mt., Cape Province (L. Péringuey).

19. **Leptogenys (Lobopelta) intermedia** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿).

Leptogenys intermedia Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 32 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

Natal: Durban, Umgeni (G. Arnold).

20. **Leptogenys (Lobopelta) nitida** (F. Smith) Wasmann, 1899, Deutsch. Ent. Zeitschr., p. 404. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 110; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 11 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 101 (☿; part).

Ponera nitida F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 92 (☿). Roger, 1863, 'Verzeich. Formicid.,' p. 23. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 449.

Lobopelta nitida Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 358 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 45.

Leptogenys tenuis Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 376, fig. 1 (☿).

Type locality: Port Natal, Natal.

Natal: Estcourt (R. C. Wroughton), Stamford Hill (I. Trägårdh); Shivyre, 4000 ft. (Haviland). Cape Province: Ladismith (H. Brauns). Belgian Congo: Lake Kivu (Schubotz).

20_{a}. Var. **adpressa** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿).

Type locality: Grahamstown, Cape Province (Hewitt).

20_{b}. Var. **æna** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 215 (☿)

Leptogenys (Lobopelta) nitida Arnold, 1915, Ann. South African Mus., XIV, p. 101 (☿; part).

Type locality: Willowmore, Cape Province (H. Brauns).

20_3. Var. **gracilis** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 11 (☿).

Type locality: Lake Kivu, Belgian Congo (Schubotz).

20_4. Var. **grandior** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 335 (☿).

Type locality: Krantzkloof, Natal (Marley).

20*a*. Subsp. **brevinodis** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 335 (☿).

Type locality: George, Cape Province (H. Brauns).

20*b*. Subsp. **insinuata** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 11 (☿).

Type locality: Richmond, Natal (I. Trägårdh).

21. **Leptogenys (Lobopelta) parva** Forel, 1901, Rev. Suisse Zool., IX, p. 332 (☿, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 102 (☿).

Type locality: Natal (Haviland).

21_1. Var. **bellua** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 214 (☿).

Type locality: Durban, Natal (G. Arnold).

21_2. Var. **dispar** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 10 (☿).

Type locality: Zululand (I. Trägårdh).

22. **Leptogenys (Lobopelta) piroskæ** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 247 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿); 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (☿).

Type locality: Ghinda, Eritrea (K. Escherich; F. Silvestri).

23. **Leptogenys (Lobopelta) sulcinoda** (Ern. André) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102 (☿).

Lobopelta sulcinoda Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 48 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 46.

Type locality: Gaboon, French Congo.

Odontomachini Mayr

Anochetus Mayr

Anochetus Mayr, 1861, 'Europ. Formicid.,' p. 53. Emery, 1909, Deutsch. Ent. Zeitschr., p. 374; 1911, 'Gen. Insect., Ponerinæ,' p. 107.

Stenomyrmex Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 711.

Myrmecia (part) Fabricius. *Odontomachus* (part) Illiger, F. Smith, Spinola, Roger.

Genotype: *Odontomachus ghilianii* Spinola, 1851.

1. **Anochetus africanus** (Mayr) Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 47. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 1. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 351 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 131 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 108 (☿, ♀, ♂). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 331 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 372 (♀). See pp. 97 and 1012.

Stenomyrmex africanus Mayr, 1865, 'Reise Novara, Zool., II, Formicidæ,' p. 11, footnote (☿). Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 47 (☿, ♀).

Anochetus africanus var. *camerunensis* Mayr, 1896, Ent. Tidskr., XVII, p. 236 (☿, ♂). Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 476 (☿, ♀, ♂).

Type locality: Gold Coast.

Gold Coast: Aburi (F. Silvestri). Cameroon: (Sjöstedt); Mundame (Conradt); Victoria (F. Silvestri); Bibundi (Tessmann); Molundu (Schultze). French Congo: Brazzaville (Weiss); Gaboon. Belgian Congo: Medje (Lang and Chapin). German East Africa: Kibosho (Katona). Somaliland: (C. Keller).

1$_1$. Var. **obscuratus** (Santschi) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 108 (☿, ♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 56 (☿, ♀).

Anochetus madagascariensis var. *obscuratus* Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 351 (☿, ♀).

Type locality: Kibosho, Mt. Kilimanjaro, German East Africa (C. Alluaud).

German East Africa: New Moschi (Alluaud and Jeannel). British East Africa: Mwatate, Wa-Taita Province (C. Alluaud).

2. **Anochetus bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 309 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 203 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 103 (☿, ♀, ♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 400 (♀). See p. 99.

Type locality: Bukama, Belgian Congo (J. Bequaert).

Belgian Congo: (Kohl); Garamba (Lang and Chapin). Rhodesia: Bulawayo (G. Arnold).

2a. Subsp. **abstractus** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 12 (☿).

Type locality: Amanzimtoti, Natal (I. Trägårdh).

3. **Anochetus concinnus** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 9 (♀).

Type locality: Lugombe, Belgian Congo (Gérard).

4. **Anochetus estus** Wm. M. Wheeler. See p. 98 (☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

5. **Anochetus grandidieri** Forel. See p. 1013.

5$_1$. Var. **katonæ** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 1 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 109 (☿).

Type locality: Moschi, German East Africa (Katona).

6. **Anochetus levaillanti** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 21 (☿). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 248 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 108 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 108 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 107 (☿, ♀), Pl. III, figs. 25, 25a, 25b.

Type locality: Hamman's Kraal, Transvaal (E. Simon).

Southern Rhodesia: Springvale (G. Arnold). Eritrea: Nefasit (K. Escherich).

7. **Anochetus opaciventris** Wm. M. Wheeler. See p. 98 (☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

8. **Anochetus parvus** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 330 (☿).

Type locality: Olokemeji, Nigeria (F. Silvestri).

8_1. Var. **longiceps** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 331 (♀).

Type locality: Victoria, CAMEROON (F. Silvestri).

9. **Anochetus pellucidus** EMERY, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 33 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 109 (☿).

Type locality: CAMEROON (Conradt).

9_1. Var. **aurifrons** SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 351 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 109 (☿).

Type locality: FRENCH CONGO.

9_2. Var. **maynei** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 347 (♀).

Type locality: Congo da Lemba, BELGIAN CONGO (R. Mayné).

10. **Anochetus punctaticeps** MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 4 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 109 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 105 (☿), Pl. III, fig. 26. See p. 99.

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

BELGIAN CONGO: Babeyru (Lang and Chapin).

11. **Anochetus punctatus** SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 13 (☿).

Type locality: Lake Sibayi, ZULULAND (I. Trägårdh).

11_1. Var. **occidentalis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 330 (☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

12. **Anochetus rothschildi** FOREL, 1907, Rev. d'Ent. Caen, XXVI, p. 129 (☿, ♂ ?). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 109 (☿).

Type locality: Daouélé, SOMALILAND (de Rothschild).

ABYSSINIA: Diré Daua; Upper Aouache, Endessa (de Rothschild).

13. **Anochetus talpa** FOREL, 1901, Rev. Suisse Zool., IX, p. 351 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 110 (☿). SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 331 (☿). ARNOLD, 1915, Ann. South African Mus., XIV, p. 106 (☿).

Type locality: NATAL (Haviland).

NIGERIA: Ibadan (F. Silvestri).

14. **Anochetus trægaordhi** MAYR, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 2 (☿). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 351 (☿). FOREL, 1916, Rev. Suisse Zool., XXIV, p. 400 (☿).

Anochetus tragaordhi EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 110 (☿).

Anochetus trägaordhi KARAWAIEW, 1911, Rev. Russe Ent., XI, p. 3 (☿).

Type locality: Khartum, ANGLO-EGYPTIAN SUDAN (I. Trägårdh; Karawaiew).

FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: (Kohl).

Odontomachus LATREILLE

Odontomachus LATREILLE, 1805, 'Hist. Nat. Crust. Ins.,' XIII, p. 257. MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 710. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 111.

Pedetes BERNSTEIN, 1861, Verh. Zool. Bot. Ges. Wien, XI, Sitzb., p. 7.

Formica (part) LINNÆUS, LATREILLE, etc. *Myrmecia* (part) FABRICIUS. *Ponera* (part) LATREILLE, LEPELETIER.

Atta Patton, 1894, American Naturalist, XXVIII, p. 618.

Genotype: *Formica hæmatoda* Linnæus, 1758.

1. **Odontomachus assiniensis** Emery, 1892, Ann. Soc. Ent. France, LX, (1891), pp. 558, 560 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 49. Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 476 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350 (♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 27. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 113 (☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p.362 (☿, ♀); 1913, Rev. Zool. Afr., II, p. 309 (☿); 1913, Rev. Suisse Zool., XXI, p. 666 (☿, ♀, ♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 332 (☿); 1914, Deutsch. Ent. Zeitschr., p. 288 (♂); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 57 (☿, ♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 372 (☿). See p. 100.

Odontomachus intermedius Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 378 (☿).

Odontomachus assiniensis subsp. *intermedius* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 14.

Type locality: Assinie, Ivory Coast (C. Alluaud).

Gold Coast: Aburi (F. Silvestri). Togo: Bismarckburg (Conradt; Büttner); Misahöhe (Baumann). Cameroon: (Bartsch); Molundu (Schultze); Mundame (Conradt); Soppo (von Rothkirch). Fernando Po: (Conradt). French Congo: between Fort de Possel and Fort Crampel (Schubotz); Brazzaville (A. Weiss). Belgian Congo: Beni (Borgerhoff), Kimpoko (Büttner); Bakaie, between Nyangwe and Stanleyville (Fauconnet); Akenge; Medje; Ngayu; Niangara; Niapu (Lang and Chapin). German East Africa: Buiko (H. Prell); Amani (Zimmer), Buddu Forest (Schubotz). Uganda: Toro; Unyoro, Mubende Region; Ibanda, Mt. Ruwenzori, 1400 m. (C. Alluaud).

1_1. Var. **aterrimus** Wm. M. Wheeler. See p. 102 (☿).

Type locality: Niapu, Belgian Congo (Lang and Chapin).

1_2. Var. **furvior** Wm. M. Wheeler. See p. 101 (☿, ♀).

Type locality: Faradje, Belgian Congo (Lang and Chapin).

Belgian Congo: Yakuluku; Stanleyville; Bafwasende; Medje; Ngayu; Akenge; Boyulu; Niangara (Lang and Chapin); Thysville (J. Bequaert).

1_3. Var. **fuscus** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 372 (☿, ♀).

Type locality: Duma, Belgian Congo (Schubotz).

1*a*. Subsp. **caffrorum** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 14 (☿).

Type locality: Dukudu, Zululand (I. Trägårdh).

1*b*. Subsp. **fauconneti** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 27 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 113 (☿).

Type locality: Bakaie, between Nyangwe and Stanleyville, Belgian Congo (Fauconnet).

2. **Odontomachus hæmatoda** (Linnæus) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 50. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 2 (☿). Mayr, 1896, Ent. Tidskr., XVII, p. 238 (♂). Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500; 1899, Mem. Accad. Sc. Bologna, (5) VIII, p. 3 (larva), Pl. I, fig. 4; 1911, 'Gen. Insect.,

Ponerinæ,' p. 114, Pl. III, fig. 18. Arnold, 1915, Ann. South African Mus., XIV, p. 108 (☿, ♀, ♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 373 (☿, ♀). **See pp. 102 and 1013.**

Formica hæmatoda Linnæus, 1758, 'Syst. Nat.,' Ed. 10, I, p. 582 (☿). P. F. Gmelin, 1766, 'Onomatol. Hist. Nat.,' III, p. 925. Linnæus, 1767, 'Syst. Nat.,' Ed. 12, I, 2, p. 965 (☿). Fabricius, 1775, 'Syst. Ent.,' p. 395 (☿). Ph. L. Müller, in Linnæus, 1775, 'Vollst. Natursyst.,' V, 2, p. 916 (☿), Pl. XXVII, fig. 17. Fabricius, 1781, 'Spec. Insect.,' I, p. 494 (☿); 1787, 'Mantissa Insect.,' I, p. 311 (☿). Gmelin, in Linnæus, 1790, 'Syst. Nat.,' Ed. 13, I, 5, p. 2803 (☿). Christ, 1791, 'Naturg. d. Insect.,' p. 516 (☿). Olivier, 1791, 'Encycl. Méthod. Insect.,' VI, p. 502 (☿). Fabricius, 1793, 'Ent. Syst.,' II, p. 364 (☿). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 192 (☿).

Formica maxillosa DeGeer, 1773, 'Mém. Hist. Ins.,' III, p. 601 (♀), Pl. XXXI, figs. 3–5. Göze, in DeGeer, 1780, 'Abh. Gesch. Insekt.,' III, p. 390 (♀), Pl. XXXI, figs. 3–5. Retzius, 1783, 'Gen. et Spec. Insect.,' p. 75 (♀).

Formica unispinosa Fabricius, 1793, 'Ent. Syst.,' II, p. 359 (☿). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 193 (☿), Pl. VIII, fig. 53.

Myrmecia hæmatoda Fabricius, 1804, 'Syst. Piez.,' p. 425 (☿).

Myrmecia unispinosa Fabricius, 1804, ibid., p. 423 (☿). Olivier, 1811, 'Encycl. Méthod. Insect.,' VIII, p. 114 (☿).

Odontomachus hæmatodes Latreille, 1805, 'Hist. Nat. Crust. Ins.,' XIII, p. 257 (☿). Illiger, 1807, Mag. f. Insectenk., VI, p. 194. Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 187 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 76 (☿, ♀, ♂), Pl. V, figs. 4–7. Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262; 1859, Arch. f. Naturg., XXV, 2, p. 431. Roger, 1861, Berlin. Ent. Zeitschr., V, p. 24 (☿, ♀, ♂). Gerstæcker, in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 503 (☿, ♂). Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 711; 1863, ibid., XIII, p. 436. Roger, 1863, 'Verzeich. Formicid.,' p. 22. Mayr, 1867, Tijdschr. v. Ent., V, p. 79 (☿, ♀); 1867, Journ. Mus. Godeffroy, XII, p. 85. W. F. Kirby, 1884, Ann. Mag. Nat. Hist., (5) XIII, p. 405. Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 538 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿). Wasmann, 1892, Wien. Ent. Zeitg., XI, p. 317. Emery, 1892, Ann. Soc. Ent. France, LX, (1891), pp. 557 and 561 (☿, ♀). Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 126. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 22. Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 47 (☿, ♀). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 213 (☿, ♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 350 (☿, ♀). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 51 (♀, ♂). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 130 (☿, ♀). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 4 (☿, ♂); 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 179 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, pp. 108 and 347 (☿, ♀); 1913, Rev. Zool. Afr., II, p. 309 (♀). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 442 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 58 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 331 (☿, ♀); 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 2 (☿).

Odontomachus unispinosus Illiger, 1807, Mag. f. Insectenk., VI, p. 194. Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 187 (☿, ♀). F. Smith, 1853, Trans. Ent. Soc. London, (2) II, Proc., p. 134.

Ponera (Odontomachus) hæmatoda LATREILLE, 1809, 'Gen. Crust. Ins.,' IV, p. 128.

Ponera (Odontomachus) unispinosa LATREILLE, 1809, ibid., IV, p. 128.

Ponera hæmatoda LEPELETIER, 1825, 'Encycl. Méthod. Insect.,' X, p. 184 (☿).

Ponera unispinosa LEPELETIER, 1825, ibid., X, p. 184 (☿).

Formica (Odontomachus) hæmatodes BLANCHARD, in Cuvier, 1849, 'Règne Animal,' Ed. 3, Insect., Pl. CXVII, fig. 6 (♀).

Odontomachus simillimus F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 80 (♀), Pl. V, figs. 8–9; 1860, Journ. Proc. Linn. Soc. London, Zool., IV, Suppl., p. 72.

Odontomachus hæmatodes var. *microcephalus* EMERY, 1890, Bull. Soc. Ent. Italiana, XXII, p. 104, Pl. V, fig. 1 (mermithergate).

Type locality: "in America meridionali."

Tropicopolitan. SENEGAMBIA: Thiès (F. Silvestri). FRENCH GUINEA: Kindia (F. Silvestri). LIBERIA: Junk River (H. Brauns). IVORY COAST: Assinie (C. Alluaud). GOLD COAST: Kitta (H. Brauns); Aburi (F. Silvestri). NIGERIA: Ibadan; Lagos; Olokemeji (F. Silvestri); Oni Camp, 70 miles east of Lagos (Lamborn). CAMEROON: (H. Brauns); Barombi (Freyer); Bibundi (Tessmann); Yaunde (Zenker); Moliwe region (Conradt); Victoria (F. Silvestri). FERNANDO PO: (Conradt). SPANISH GUINEA: Alen (Tessmann). SAN THOMÉ: (de Seabra). FRENCH CONGO: Ogowe (Mocquerys); Brazzaville (A. Weiss). BELGIAN CONGO: Kimpoko (Büttner); Boma (Leboutte); Leopoldville (Lamarche); Congo da Lemba (R. Mayné); Libenge (Schubotz); Mayombe (de Briey); Duma (Montchal); Stanleyville; Malela; Faradje; Zambi; Avakubi; Leopoldville; Vankerckhovenville; Garamba; Akenge (Lang and Chapin); Matadi; Katala (J. Bequaert). SOUTHERN RHODESIA: Bulawayo (G. Arnold). BECHUANALAND: Severelela; Khakhea to Kang (L. Schultze). TRANSVAAL: Hamman's Kraal (E. Simon); Lydenburg. DELAGOA: (Liengme). MOZAMBIQUE: (Peters). UGANDA: Ibanda; Kitagueta; Butiti; Nakitawa (Duke of Abruzzi); Entebbe (H. Schultze). BRITISH EAST AFRICA: Shimoni; Kisumu; Mombasa (Alluaud and Jeannel). ABYSSINIA: (Ilg); Dimé to Bass Narok (V. Bottego). ANGLO-EGYPTIAN SUDAN: Khor Attar (F. Werner); Bahr-el-Salaam (Magretti). ERITREA: Sogodas; Kor Lebka (Magretti).

2_1. Var. **stanleyi** WM. M. WHEELER. See p. 102 (☿).

Type locality: Stanleyville, BELGIAN CONGO (Lang and Chapin).

2_2. Var. **troglodytes** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 58 (☿).

Type locality: Shimoni, BRITISH EAST AFRICA (Alluaud and Jeannel).

PSEUDOMYRMINÆ Emery

Pseudomyrmini Emery

Tetraponera F. SMITH

Tetraponera F. SMITH, 1852, Ann. Mag. Nat. Hist., (2) IX, p. 44; 1877, Trans. Ent. Soc. London, p. 68. DONISTHORPE, 1916, Ent. Record, XXVIII, p. 244.

Sima ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 178. EMERY, 1915, Zool. Anzeiger, XLV, pp. 265–266; 1917, Bull. Soc. Ent. France, p. 94.

Tetraponera EMERY (as a subgenus). *Pseudoponera* (part) SMITH. *Eciton* JERDON (*nec* Latreille).

Genotype: *Eciton nigrum* Jerdon, 1851 = *Tetraponera atrata* Smith, 1852.

1. **Tetraponera ambigua** (Emery).

Sima ambigua Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 23 (☿, ♀). Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 89 (without description); 1901, ibid., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (☿, ♀, ♂).

Sima (Tetraponera) ambigua Arnold, 1916, Ann. South African Mus., XIV, p. 185 (☿, ♀, ♂).

Type locality: Hamman's Kraal, Transvaal (E. Simon).

Transvaal: Makapan (E. Simon). Bechuanaland: Kang to Kgokong (L. Schultze). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). Southern Abyssinia: (Ilg).

1a. Subsp. **erythræa** (Emery).

Sima ambigua subsp. *erythræa* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 23 (☿).

Type locality: Aden, Arabia (E. Simon).

1*b*. Subsp. **rhodesiana** (Forel).

Sima ambigua subsp. *rhodesiana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 112 (☿). Arnold, 1914, Proc. Rhodesia Sc. Ass., XIII, p. 31, Pl., fig. 1 (☿).

Sima (Tetraponera) ambigua subsp. *rhodesiana* Arnold, 1916, Ann. South African Mus., XIV, p. 186 (☿, ♀).

Type locality: Plumtree, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Bembesi (G. Arnold).

2. **Tetraponera andrei** (Mayr).

Sima andrei Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 179 (☿).

Type locality: Delagoa Bay, Portuguese East Africa (H. Brauns).

3. **Tetraponera anthracina** (Santschi). See p. 106.

Sima anthracina Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 355 (☿); 1910, ibid., LXXIX, p. 352, fig. 3 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 275 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (☿); 1916, Rev. Suisse Zool., XXIV, p. 403 (☿).

Type locality: Combra Tora, French Congo (A. Weiss).

Belgian Congo: St. Gabriel (Kohl); Kisantu; Congo da Lemba (R. Mayné); Thysville; Lubutu (Bequaert); Stanleyville (Lang and Chapin).

4. **Tetraponera bifoveolata** (Mayr).

Sima bifoveolata Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 146 (☿); in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 4 (☿).

Sima (Tetraponera) bifoveolata Arnold, 1916, Ann. South African Mus., XIV, p. 184 (☿).

Type locality: Delagoa Bay, Portuguese East Africa (H. Brauns).

Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh). Zanzibar: (H. Brauns).

A subspecies is known from Palestine.

4a. Subsp. **maculifrons** (Santschi).

Sima foveolata subsp. *maculifrons* Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 162 (☿).

Type locality: Obock, French Somaliland (Maindron).

5. **Tetraponera capensis** (F. Smith) Roger, 1863, 'Verzeich. Formicid.,' p. 24.

Pseudomyrma capensis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 160 (☿). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 451. F. Smith, 1877, Trans. Ent. Soc. London, p. 60.

Sima capensis Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 53.

Type locality: Cape of Good Hope.

6. **Tetraponera claveaui** (Santschi).

Sima claveaui Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 304 (☿).

Type locality: Senegal (Claveau).

7. **Tetraponera clypeata** (Emery).

Sima clypeata Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 361 (☿), Pl. XVII, figs. 4 and 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 53. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 24 (☿); 1899, Mem. Accad. Sc. Bologna, (5) VIII, p. 4 (larva).

Sima (Tetraponera) clypeata Arnold, 1916, Ann. South African Mus., XIV, p. 182 (☿, ♀), Pl. v, figs. 50, 50a.

Type locality: Cape of Good Hope (L. Péringuey).

Cape Province: Cape Town; Matjesfontein (E. Simon).

7a. Subsp. **braunsi** (Forel).

Sima braunsi Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 112 (☿, ♀).

Sima (Tetraponera) clypeata subsp. *braunsi* Arnold, 1916, Ann. South African Mus., XIV, p. 184 (☿, ♀), Pl. v, fig. 49.

Type locality: Willowmore, Cape Province (H. Brauns).

7a₁. Var. **durbanensis** (Forel).

Sima braunsi var. *durbanensis* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 218 (☿).

Sima (Tetraponera) clypeata subsp. *braunsi* var. *durbanensis* Arnold, 1916, Ann. South African Mus., XIV, p. 184 (☿).

Type locality: Durban, Natal (G. Arnold).

7a₂. Var. **equidentata** (Arnold).

Sima (Tetraponera) clypeata subsp. *braunsi* var. *equidentata* Arnold, 1916, Ann. South African Mus., XIV, p. 184 (☿), Pl. v, fig. 48.

Type locality: Cape Town, Cape Colony (G. Arnold).

8. **Tetraponera emeryi** (Forel).

Sima capensis Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 23 (☿) (*nec* F. Smith).

Sima emeryi Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 367 (☿).

Sima (Tetraponera) emeryi Arnold, 1916, Ann. South African Mus., XIV, p. 187 (☿).

Type locality: Pretoria, Transvaal (E. Simon).

9. **Tetraponera encephala** (Santschi).

Sima encephala Santschi, 1919, Rev. Zool. Afr., VII, p. 84 (♀).

Type locality: Saint Louis, Senegambia (Claveau).

10. **Tetraponera gerdæ** (Stitz).

Sima gerda Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 381, fig. 4 (♀).

Type locality: Amani, German East Africa (Vosseler).

11. **Tetraponera le moulti** (SANTSCHI).

Sima le moulti SANTSCHI, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 375 (♀).

Type locality: Fort Crampel, FRENCH CONGO (Le Moult).

12. **Tetraponera liengmei** (FOREL).

Sima liengmei FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 88 (☿, ♂).

Sima (*Tetraponera*) *liengmei* ARNOLD, 1916, Ann. South African Mus., XIV, p. 181 (☿, ♂).

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (Liengme).

13. **Tetraponera mayri** (FOREL).

Sima mayri FOREL, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 53 (♀).

Type locality: CAMEROON (H. Brauns).

14. **Tetraponera mocquerysi** (ERN. ANDRÉ).

Sima mocquerysi ERN. ANDRÉ, 1890, Rev. d'Ent. Caen, IX, p. 319 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 54. EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 23 (☿); 1895, Ann. Mus. Civ. Genova, XXXV, p. 178. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 146. STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 131 (☿). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXIX, p. 352, fig. 2 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 334 (☿). FOREL, 1916, Rev. Suisse Zool., XXIV, p. 403 (☿). SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 10.

Type locality: SIERRA LEONE (Mocquerys).

GOLD COAST: Chama (H. Brauns). TOGO: Bismarckburg (Conradt). FRENCH GUINEA: Kakoulima (F. Silvestri). SPANISH GUINEA: Alen (Tessmann). FRENCH CONGO: Benda (Charleux). BELGIAN CONGO: (Kohl). ABYSSINIA: Arussi Galla, Ganale Gudda (V. Bottego).

14_1. Var. **elongata** (STITZ).

Sima mocquerysi var. *elongata* STITZ, 1911, 'Wiss. Ergebn Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 378, fig. 2 (☿).

Type locality: Buddu Forest, GERMAN EAST AFRICA (N. W. of Bukoba) (Schubotz).

14_2. Var. **lepida** WM. M. WHEELER. See p. 106 (☿, ♀).

Type locality: Faradje, BELGIAN CONGO (Lang and Chapin).

BELGIAN CONGO: Yakuluku; Garamba (Lang and Chapin).

14_3. Var. **lutea** (STITZ).

Sima mocquerysi var. *lutea* STITZ, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 381, fig. 3 (☿, ♀).

Type locality: Kwidjwi Island, Lake Kivu, BELGIAN CONGO (Schubotz).

14a. Subsp. **emacerata** (SANTSCHI). See p. 107.

Sima mocquerysi subsp. *emacerata* SANTSCHI, 1910, Ann. Soc. Ent. France, LXXIX, p. 352, fig. 1 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 70 (☿, ♀).

Sima emacerata SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 9 (♀).

Type locality: Nakuru, Rift Valley, BRITISH EAST AFRICA (C. Alluaud).

CENTRAL UGANDA: (C. Alluaud). BELGIAN CONGO: Stanleyville; Faradje (Lang and Chapin); Lubutu; Kasonsero on the Semliki River (J. Bequaert); Ngazi (Elskens).

15. **Tetraponera natalensis** (F. SMITH) ROGER, 1863, 'Verzeich. Formicid.,' p. 24. F. SMITH, 1877, Trans. Ent. Soc. London, p. 69.

Pseudomyrma natalensis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 160 (♀). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 452. F. Smith, 1876, Trans. Ent. Soc. London, p. 604.

Sima capensis Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 906 (☿), Pl. xx, fig. 14. Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 113 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 53. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 43 (*nec Sima capensis* Smith).

Pseudomyrma capensis Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 357 (☿, ♀).

Sima natalensis Emery, 1892, Zool. Anzeiger, XV, p. 237; 1895, Ann. Soc. Ent. France, LXIV, p. 22 (☿, ♀); 1899, Mem. Accad. Sc. Bologna, (5) VIII, p. 4 (larva), Pl. ii, fig. 7. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 26 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 367 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 15 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 176 (☿, ♀).

Type locality: Port Natal, Natal.

South Africa generally (G. Arnold). Cape Province: (H. Brauns). Natal: Durban (Marley); Weenen District (J. M. Hutchinson); Stamford Hill (I. Trägårdh). Zululand: Umfolosi (I. Trägårdh). Transvaal: Makapan; Hamman's Kraal (E. Simon). German East Africa: Mto-ya-Kifaru (Katona); Ndara; Ugono Mts. (v. d. Decken). Somaliland: Obbia (Bricchetti-Robecchi).

15_1. Var. **obscurata** (Emery).

Sima natalensis var. *obscurata* Emery, 1895. Ann. Soc. Ent. France, LXIV, p. p. 22 (☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 274; 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 368 (☿); 1915, ibid., (5) L, p. 336 (☿).

Sima natalensis subsp. *obscurata* Arnold, 1916, Ann. South African Mus., XIV, p. 177 (☿, ♀, ♂).

Type locality: Cape of Good Hope.

Cape Province: Algoa Bay (H. Brauns). Natal: Durban (C. B. Cooper). Northern Rhodesia: shore of the Zambesi River (Fr. Steiner).

15_2. Var. **usambarensis** (Forel).

Sima natalensis var. *usambarensis* Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 367 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 70 (☿, ♀).

Type locality: Monga, German East Africa (H. Prell).

German East Africa: Kilema, Mt. Kilimanjaro, 1440 m.; Kibosho (Alluaud and Jeannel). British East Africa: Moschi (Zimmer); Mombasa; Shimoni; Nairobi, Kikuyu; Voi, Taita; Maji-ya-chumvi, Wa-Nyika (Alluaud and Jeannel).

15a. Subsp. **caffra** (Santschi).

Sima natalensis subsp. *caffra* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 15 (☿, ♀, ♂). Trägårdh, ibid., p. 43.

Sima natalensis subsp. *obscurata* var. *caffra* Arnold, 1916, Ann. South African Mus., XIV, p. 178 (☿, ♀, ♂).

Type locality: Dukudu, Zululand (I. Trägårdh).

Zululand: Lake Sibayi (I. Trägårdh).

15*b*. Subsp. **cuitensis** (Forel).

Sima natalensis subsp. *cuitensis* Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 368 (☿).

Sima natalensis Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564.

Type locality: Between the Cubango River and Cuito River, Mossamedes (Baum and Van der Kellen).

15b_1. Var. **bulawayana** (Forel).

Sima natalensis subsp. *cuitensis* var. *bulawayana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 112 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 179 (☿, ♀).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Plumtree; Bembesi; Victoria Falls (G. Arnold).

16. **Tetraponera oberbecki** (Forel).

Sima oberbecki Forel, 1911, Rev. Zool. Afr., I, p. 275 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (☿); 1916, Rev. Suisse Zool., XXIV, p. 403 (♀). Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 9.

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

Belgian Congo: Leopoldville (Kohl); Elisabethville (Leplae). French Congo Samkita (F. Faure).

17. **Tetraponera ophthalmica** (Emery). See p. 107.

Sima ophthalmica Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 98 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 403 (☿).

Type locality: Cameroon (Conradt).

Belgian Congo: Bengamisa; St. Gabriel; Stanleyville (H. Kohl); Thysville (J. Bequaert). Cameroon: Batanga (G. Schwab).

18. **Tetraponera penzigi** (Mayr).

Sima penzigi Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 10 (☿, ♀, ♂). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♀).

Sima penzegi Sjöstedt, 1908, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, pp. 116-117.

Sima (Tetraponera) penzigi Arnold, 1916, Ann. South African Mus., XIV, p. 180 (☿, ♀, ♂).

Type locality: Mt. Kilimanjaro, Kahe, German East Africa (Sjöstedt).

German East Africa: Tanda, Usambara (Sjöstedt). Bechuanaland: Lehututu (L. Schultze). Abyssinia: (Penzig).

18a. Subsp. **continua** (Forel).

Sima penzigi subsp. *continua* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 138 (☿).

Type locality: Gotta, southern Abyssinia (de Rothschild).

19. **Tetraponera prelli** (Forel).

Sima prelli Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 365 (☿).

Type locality: Monga, German East Africa (H. Prell).

19_1. Var. **odiosa** (Forel).

Sima prelli var. *odiosa* Forel, 1916, Rev. Suisse Zool., XXIV, p. 403 (☿).

Type locality: Belgian Congo (Kohl).

20. **Tetraponera schulthessi** (Santschi).

Sima schulthessi Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 249 (♀).

Type locality: Rikatla, Delagoa Bay, Portuguese East Africa (Junod).

21. **Tetraponera triangularis** (Stitz).

Sima triangularis Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 131 (☿).

Type locality: Alen, Spanish Guinea (Tessmann).

21a. Subsp. **illota** (Santschi).

Sima triangularis subsp. *illota* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 334 (☿, ♀).

Type locality: Olokemeji, Southern Nigeria (F. Silvestri).

Viticicola Wm. M. Wheeler

Viticicola Wm. M. Wheeler, 1920, Psyche, XXVII, p. 53.

Genotype: *Sima tessmanni* Stitz, 1910.

1. **Viticicola tessmanni** (Stitz). See p. 109 (☿, ♀, ♂).

Sima tessmanni Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 131, fig. 2 (☿). Santschi, 1919, Rev. Zool. Afr., VII, p. 84 (♀).

Type locality: Alen, Spanish Guinea (Tessmann).

Belgian Congo: Medje (Lang and Chapin).

1a. Var. **castanea** Wm. M. Wheeler. See p. 112 (☿, ♀).

Type locality: Avakubi, Belgian Congo (Lang and Chapin).

Pachysima Emery

Sima subg. *Pachysima* Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 97.

Genotype: *Tetraponera æthiops* F. Smith, 1877.

1. **Pachysima æthiops** (F. Smith). See p. 114.

Tetraponera æthiops F. Smith, 1877, Trans. Ent. Soc. London, p. 71 (☿).

Sima æthiops Emery, in Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 53. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 167. Santschi, 1911, Rev. Zool. Afr., I, p. 207 (♂). Forel, 1913, ibid., II, p. 352 (♀). Lamborn, 1914, Trans. Ent. Soc. London, (1913), pp. 442 and 493 (♀). H. Schmitz, 1915, Deutsch. Ent. Zeitschr., p. 500.

Sima spininoda Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 51 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 55. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 99, 103, 104, 106, 108, and 167. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 131 (☿, ♀); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 381 (☿, ♀).

Sima (Pachysima) æthiops Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 97, figs. 2 and 3 (☿, ♀, larva). Forel, 1913, Rev. Suisse Zool., XXI, p. 668 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (♀); 1916, Rev. Suisse Zool., XXIV, p. 403 (☿, ♀). Arnold, 1916, Ann. South African Mus., XIV, p. 174 (☿, ♀, ♂).

Sima (Pachysima) spininoda Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 374 (☿, ♀, ♂).

Type locality: South Africa.

Southern Nigeria: Oni Camp, east of Lagos (Lamborn). Fernando Po: (Conradt). Cameroon: Bipindi (Zenker); Mundame (Conradt); Bibundi (Tessmann); Metit (G. Schwab). Spanish Guinea: Eloby Island (H. Brauns); Alen (Tessmann). French Congo: Samkita (F. Faure). Belgian Congo: Kibombo (J. Bequaert); Watikaia; Tshopo River; Candolo; Okiavo-Lindi River; St. Gabriel (Kohl); Mawambi to Avakubi; Duma; Libenge (Schubotz); Avakubi; Stanleyville; Ambelokudi; Isangi; Panga; Medje; Bafwabaka (Lang and Chapin).

2. **Pachysima latifrons** (Emery). See p. 120.

Sima (Pachysima) latifrons Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 98, fig. 4 (♀). Forel, 1913, ibid., LVII, p. 350 (♀). Santschi, 1914, Deutsch. Ent. Zeitschr., p. 288 (☿, ♀, ♂).

Sima æthiops FOREL, 1913, Rev. Zool. Afric., II, p. 315 (♀).

Type locality: Gaboon, FRENCH CONGO.

BELGIAN CONGO: Kondué (Luja); Niangara (Lang and Chapin). CAMEROON: Tiko near Victoria (F. Silvestri). FRENCH CONGO: Lobay (Ringenbach).

MYRMICINÆ Lepeletier

Myrmicini Emery

Cratomyrmex EMERY

Cratomyrmex EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 572.

Genotype: *Cratomyrmex regalis* Emery, 1892.

1. **Cratomyrmex regalis** EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 572 (♀), Pl. XV, fig. 16. SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 307, fig. 3 (☿, ♀); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 335 (☿).

Messor (Cratomyrmex) regalis SANTSCHI, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 377 (☿).

Type locality: Benue, NIGERIA.

LOWER DAHOMEY: Aguagua (Roubaud). NIGERIA: Lagos; Olokemeji (F. Silvestri). CONGO: (Cabra).

1_1. Var. **rubeus** SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 308 (☿).

Type locality: LOWER DAHOMEY (Le Moult).

1_2. Var. **sculpturatus** (STITZ).

Cratomyrmex sculpturatus STITZ, 1916, 'Wiss. Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 378, fig. 2 (☿).

Type locality: Fort de Possel to Fort Crampel, FRENCH CONGO (Schubotz).

FRENCH CONGO: Falls of the Nana River near Fort Crampel (Haberer).

Pheidolini Emery

Messor FOREL

Aphænogaster subg. *Messor* FOREL, 1890, Ann. Soc. Ent. Belgique, XXXIV, C.R., p. lxviii.

Messor EMERY, 1908, Deutsch. Ent. Zeitschr., p. 437.

Formica (part) FABRICIUS, GMELIN, LATREILLE, etc. *Myrmica* (part) FÖRSTER. *Atta* (part) SMITH, ROGER. *Aphænogaster* (part) ERN. ANDRÉ, DALLA TORRE, EMERY, MAYR, etc. *Stenamma* (part) EMERY, FOREL, MAYR, etc.

Genotype: *Formica barbara* Linnæus.

1. **Messor barbarus** (LINNÆUS) EMERY, 1908, Deutsch. Ent. Zeitschr., p. 442 (♃, ☿, ♀, ♂).

Formica barbara LINNÆUS, 1767, 'Syst. Nat.,' Ed. 12, I, 2, p. 962 (☿).

Aphænogaster barbara MAGRETTI, 1877, Ann. Mus. Civ. Genova, IX, p. 373 (☿, ♀, ♂); 1884, ibid., XXI, p. 541 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 99.

Aphænogaster (Messor) barbara FOREL, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿).

Stenamma (Messor) barbarum FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 373 (♀).

Type locality: Barbary.

The following localities probably all refer to some of the subspecies or varieties mentioned below.

Anglo-Egyptian Sudan: El Hefera, Settit; Metemma; Sebderat (Magretti); Godo Burka (Kachovskij). Somaliland: (C. Keller). Eritrea: Keren; Kor Lebka (Magretti).

1_1. Var. **punctatus** (Forel).

Aphænogaster barbara var. *punctata* Forel, 1886, Journ. Asiat. Soc. Bengal, LV, pt. 2, p. 248 (☿).

Aphænogaster (*Messor*) *barbara* var. *punctata* Emery, 1891, 'Explor. Tunisie, Fourmis,' p. 12. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 89.

Messor barbarus subsp. *punctatus* Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 187, 198, 201, and 203. Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 396.

Type locality: Kashmir, India.

Abyssinia: Abuker; Diré Daua; Harar (Kristensen); southern Abyssinia (Ilg).

1a. Subsp. **latinodus** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 93, fig. 2, *2* (☿).

Type locality: East Africa (?) (Reichensperger).

1*b*. Subsp. **lübberti** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 13 (☿).

Messor barbarus subsp. *lubberti* Arnold, 1920, Ann. South African Mus., XIV, p. 411 (☿).

Type locality: Okahandja, German Southwest Africa (Peters).

German Southwest Africa: (Lübbert).

1*c*. Subsp. **ruginodis** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11;' I, p. 374, fig. 1 (☿).

Type locality: Fort Crampel, French Congo (Schubotz).

1*d*. Subsp. **semirufus** (Ern. André) Emery, 1908, Deutsch. Ent. Zeitschr., pp. 445 and 447 (♃, ☿, ♀).

Aphænogaster barbara var. *semirufa* Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 355 and 368 (☿, ♀).

Type locality: not designated; described from the shores of the Caspian Sea, Syria, Persia, and Abyssinia.

$1d_1$. Var. **angularis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 75 (☿).

Type locality: Naivasha, 1900 m., British East Africa (Alluaud and Jeannel).

$1d_2$. Var. **galla** Emery, 1908, Deutsch. Ent. Zeitschr., p. 447, footnote. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 250 (☿). Escherich, 1911, Biol. Centralbl., XXXI, p. 48, footnote. Karawaiew, 1911, Rev. Russe Ent., XI, p. 3 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (☿, ♀, ♂).

Aphænogaster (*Messor*) *barbarus* Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 112.

Stenamma (*Messor*) *barbarum* subsp. *caduca* var. *galla* Emery, 1895, ibid., XXXV, p. 179 (☿).

Messor barbarus subsp. *caducus* var. *galla* Emery, 1897, ibid., XXXVIII, p. 597.

Stenamma (*Messor*) *barbarum* var. *galla* Mayr, in Jagerskiold, 1903, 'Exped., IX, Formicid.,' p. 5; in Sjostedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 14 (☿, ♀).

Messor barbarus subsp. *galla* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 335 (☿); 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 92, fig. 2, *1* (☿).

Type locality: Boran Galla, Upper Ganale, Abyssinia (V. Bottego).

Senegambia: Dakar; Thiès (F. Silvestri); Longa. Anglo-Egyptian Sudan: Khartum (Karawaiew); White Nile Region (I. Trägårdh). Abyssinia: (Ilg); Webi; Ogaden (Bricchetti-Robecchi); Kaka, Schoa (Antinori). Somaliland: Milmil (Ruspoli); Mogadiscio; Errer-es-Saghir (Bricchetti-Robecchi); Obbia (Pavesi). Eritrea: Asmara; Keren; Nefasit (F. Silvestri); Bogos (Antinori). German East Africa: Mt. Meru; Kibonoto, Mt. Kilimanjaro (Sjöstedt).

1d_3. Var. **rufulus** Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 156.

Messor barbarus subsp. *semirufus* var. *rufa* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 250 (☿). Escherich, 1911, Biol. Centralbl., XXXI, p. 48, footnote. Karawaiew, 1911, Rev. Russe Ent., XI, p. 4 (☿). (*nec rufa* Karawaiew, 1909).

Type locality: Nefasit, Eritrea (K. Escherich).

Anglo-Egyptian Sudan: Khartum (Karawaiew).

1d_4. Var. **triempressus** (Santschi).

Messor barbarus subsp. *galla* var. *triempressa* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 92 (☿).

Type locality: Baguirmi, Techeckna, Chari-Chad.

Casamance: (Claveau). Abyssinia: Harar; Schoa.

2. **Messor braunsi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 138 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 413 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

3. **Messor capensis** (Mayr).

Atta capensis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 743 (☿); 1863, ibid., XIII, p. 396.

Aphænogaster capensis Roger, 1863, 'Verzeich. Formicid.,' p. 30. Mayr, 1865, 'Reise Novara, Zool.,' II. Formicidæ, p. 87 (☿), Pl. III, fig. 25; 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 896 (☿, ♂), Pl. XX, fig. 9. Emery, 1884, Ann. Mus. Civ. Genova, XXI, p. 383 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 101.

Aphænogaster barbara var. *capensis* Péringuey, 1886, Trans. Ent. Soc. London, Proc., p. xxxvii. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 113. Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 340.

Stenamma (*Messor*) *barbarum* subsp. *capense* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 35.

Aphænogaster (*Messor*) *barbara* var. *capensis* Wasmann, 1896, Notes Leyden Mus., XVIII, p. 75.

Aphænogaster barbara subsp. *capensis* Bingham, 1906, Trans. Ent. Soc. London, Proc., p. xxv (♀, ♂).

Messor barbarus subsp. *capensis* Arnold, 1913, Proc. Rhodesia Sc. Assoc., XII, p. 14. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 242 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 405 (☿, ♀, ♂).

Stenamma (*Aphænogaster*) *capense* Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, p. 16.

Type locality: Cape of Good Hope (Novara Expedition).

Cape Province: Cape Town (E. Simon); Kimberley (Dixey and Longstaff); Willowmore (G. Arnold). Transvaal: Makapan; Pretoria (E. Simon). Natal: Durban (G. Arnold); Wessels Neck (C. B. Cooper).

3_1. Var. **probus** (Forel).

Messor barbarus subsp. *capensis* var. *probus* Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 266 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 410 (☿).

Type locality: Bothaville, Orange Free State (H. Brauns).

3_2. Var. **schenki** (Forel).

Messor barbarus subsp. *capensis* var. *schenki* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 15 (☿).

Messor barbarus subsp. *capensis* var. *schencki* Arnold, 1920, Ann. South African Mus., XIV, p. 410 (☿).

Type locality: Bethanien, German Southwest Africa (Schenck).

3_3. Var. **tropicorum** (Forkl).

Messor barbarus subsp. *capensis* var. *tropicorum* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 444 (☿).

Type locality: Mossamedes (Baum and Van der Kellen).

3*a*. Subsp. **decipiens** (Forel) Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 94.

Stenamma (*Messor*) *barbarum* subsp. *capense* var. *decipiens* Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 177 (☿, ♀).

Messor barbarus subsp. *capensis* var. *decipiens* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 15 (♀). Arnold, 1920, Ann. South African Mus., XIV, p. 410 (☿).

Type locality: Natal (R. C. Wroughton).

Cape Province: Cape Flats near Cape Town (L. Schultze).

3*b*. Subsp. **pseudægyptiacus** (Emery).

Aphænogaster pseudægyptiaca Emery, 1884, Ann. Mus. Civ. Genova, XXI, p. 384 (☿).

Aphænogaster (*Messor*) *barbarus* subsp. *capensis* var. *pseudo-ægyptiaca* Emery, 1891, 'Explor. Tunisie, Fourmis,' p. 12.

Stenamma (*Messor*) *barbarum* subsp. *capense* var. *pseudo-ægyptiacum* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 35.

Messor capensis subsp. *pseudo-ægyptiaca* Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 94.

Messor barbarus subsp. *capensis* var. *pseudoægyptiaca* Arnold, 1920, Ann. South African Mus., XIV, p. 408 (☿, ♀, ♂), Pl. v, figs. 59 and 59*a*-*b*.

Type locality: Cape of Good Hope (L. Péringuey).

Transvaal: Makapan (E. Simon). Rhodesia: Bulawayo (G. Arnold).

4. **Messor cephalotes** Emery, 1908, Deutsch. Ent. Zeitschr., p. 443.

Stenamma (*Messor*) *barbarum* subsp. *cephalotes* Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 179 (☿); 1897, ibid., XXXVIII, p. 597 (☿). Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 61 (☿).

Stenamma (*Messor*) *barbarum* var. *cephalotes* Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 14.

Type locality: Arussi Galla, Ganale Gudda, Abyssinia (V. Bottego).

Abyssinia: Giari Bule (Ruspoli). British East Africa: Leitokitok, Ngare Rongai (Sjöstedt).

4a. Subsp. **plinii** Santschi, 1917, Bull. Soc. Hist. Nat. Afr. Nord, VIII, p. 94.

Messor plinii Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 165 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 75 (☿).

Type locality: Nakuru, Rift Valley, 1820 m., British East Africa (Ch. Alluaud).

British East Africa: Tehania-Kamiti, Kikuyu (Alluaud and Jeannel).

5. **Messor denticornis** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 14 (☿, ♀, ♂), Pl. i, figs. 1 and 3. Arnold, 1920, Ann. South African Mus., XIV, p. 411 (☿, ♀, ♂).

Type locality: Lüderitz Bay, German Southwest Africa (L. Schultze).

German Southwest Africa: Ababis (R. W. Tucker). Cape Province: Kamaggas; Steinkopf (L. Schultze); Kimberley (G. Arnold).

5_1. Var. **brunni** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 444 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 413 (☿).

Type locality: Southwest Africa (Brunn).

Cape Province: Steckstown (Wartmann).

5_2. Var. **parvidens** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 15 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 413 (☿).

Type locality: Kubub, German Southwest Africa (L. Schultze).

Pheidole Westwood

Pheidole Westwood, 1840, Ann. Mag. Nat. Hist., VI, p. 87.

Leptomyrma Motschulsky, 1863, Bull. Soc. Nat. Moscou, XXXVI, p. 17.

Phidole Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 220.

Œcophthora Heer, 1852, 'Hausameise Madeiras,' p. 15.

Aphænogaster (part) Emery. *Atta* (part) Sykes, F. Smith. *Formica* (part) Fabricius et auct. *Myrmica* (part) Smith et auct. *Œcodoma* (part) Jerdon, Moggridge. *Pristomyrmex* Mayr.

Genotype: *Atta providens* Sykes, 1835.

All the Ethiopian species belong to the subgenus *Pheidole, sensu stricto*.

1. **Pheidole æberlii** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 91 (♃, ☿, ♂); 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 172.

Pheidole aberlei Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 7 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (☿). Emery, 1916, Rev. Zool. Afr., IV, p. 250.

Type locality: Upper Senegal, Senegambia.

Senegambia: Thiès (F. Silvestri). Anglo-Egyptian Sudan: Omdurman (I. Trägårdh).

1a. Subsp. **erythræa** Emery, 1916, Rev. Zool. Afr., IV, p. 250.

Pheidole aberlii var. *erythræa* Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 61 (♃, ☿).

Type locality: Massaua, Eritrea (Belli).

Eritrea: Ghinda (Belli).

2. **Pheidole akermani** Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 471 (♃, ☿).

Type locality: Pietermaritzburg, Natal (C. Akerman).

3. **Pheidole areniphila** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30; 1910, Ann. Soc. Ent. Belgique, LIV, p. 14. Arnold, 1920, Ann. South African Mus., XIV, p. 479 (♃, ☿, ♀, ♂).

Pheidole arenicola Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 11 (♃, ☿, ♀, ♂).

Type locality: Khakhea, Bechuanaland (L. Schultze).

4. **Pheidole arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 130 (♃, ☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 445, fig. 25 (♃, ☿, ♀, ♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

Southern Rhodesia: common (G. Arnold).

4_1. Var. **ballaensis** Arnold, 1920, Ann. South African Mus., XIV, p. 448 (♃, ☿).

Type locality: Balla-Balla, Southern Rhodesia (G. Arnold).

4_2. Var. **rufescens** Arnold, 1920, Ann. South African Mus., XIV, p. 449 (♃, ☿).

Type locality: Sipapoma, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Victoria Falls (G. Arnold).

5. **Pheidole aspera** Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 746 (♃, ☿); 1863, ibid., XIII, p. 440. Roger, 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 97 (♃, ☿, ♂), Pl. III, fig. 26. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 88. Arnold, 1920, Ann. South African Mus., XIV, p. 477 (♃, ☿).

Type locality: Cape of Good Hope (Novara Expedition).

6. **Pheidole aurivillii** Mayr, 1896, Ent. Tidskr., XVII, p. 238 (♃, ☿). Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 29. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 369 (♃, ☿, ♂); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿).

Type locality: Cameroon (Sjöstedt).

French Guinea: Kakoulima (F. Silvestri). French Congo: Brazzaville (A. Weiss).

6_1. Var. **attenuata** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 370 (♃). See p. 129.

Type locality: M'Piaka, French Congo (A. Weiss).

Belgian Congo: Medje; Bafwabaka (Lang and Chapin); Walikale to Lubutu (J. Bequaert).

6_2. Var. **rubricalva** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 337 (♃, ☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

6a. Subsp. **kasaiensis** Forel, 1911, Rev. Zool. Afr., I, p. 279 (♃, ☿); 1913, ibid., II, p. 353 (♃, ☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 443 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 415 (♃, ☿, ♀).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: St. Gabriel (Kohl). Southern Nigeria: Lagos (Lamborn).

$6a_1$. Var. **amalricæ** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 336 (♃, ☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

7. **Pheidole batrachorum** Wm. M. Wheeler. See p. 128 (♃, ☿).

Type locality: Akenge, Belgian Congo (Lang and Chapin).

8. **Pheidole bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 330 (♃, ☿). Bequaert, ibid., p. 427.

Type locality: Lake Kabwe, Belgian Congo (J. Bequaert).

9. **Pheidole buchholzi** Mayr, 1900, Ent. Tidskr., XXI, p. 276 (♃, ☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 336 (♀). Forel, 1916, Rev. Suisse Zool., XXIV, p. 413 (☿, ♀).

Type locality: Mungo River, Cameroon (R. Buchholz).

Cameroon: (L. v. Muralt); Victoria (F. Silvestri). Belgian Congo: Makanga (Kohl).

10. **Pheidole caffra** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 33 (♃). Santschi, 1910, ibid., LXXVIII, (1909), p. 361 (♃). Arnold, 1920, Ann. South African Mus., XIV, p. 478 (♃).

Type locality: Hamman's Kraal, Transvaal (E. Simon).

French Congo: Brazzaville (A. Weiss).

10_1. Var. **amœna** Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 365 (♃).

Type locality: Eritrea.

10a. Subsp. **abyssinica** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 254 (♃, ☿). Reichensperger, 1913, ibid., XXXV, p. 193.

Pheidole caffra subsp. *abessinica* Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 199; 1918, ibid., LX, (1917), p. 395.

Type locality: Ghinda, Eritrea (K. Escherich).

Abyssinia: Bisa Timo near Harar; Harar (Kristensen). Eritrea: Nefasit (K. Escherich).

10*b*. Subsp. **bayeri** Forel, 1916, Rev. Suisse Zool., XXIV, p. 413 (♃, ☿).

Type locality: Kasindi, Belgian Congo (Bayer).

$10b_1$. Var. **thysvillensis** Wm. M. Wheeler. See p. 130 (♃, ☿).

Type locality: Thysville, Belgian Congo (Lang and Chapin; J. Bequaert).

10*c*. Subsp. **senilifrons** Wm. M. Wheeler. See p. 130 (♃, ☿).

Type locality: Yakuluku, Belgian Congo (Lang and Chapin).

11. **Pheidole capensis** Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 746 (♃, ☿); 1865, ibid., XIII, p. 440. Roger, 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 100 (♃, ☿), Pl. iv, fig. 29. Péringuey, 1886, Trans. Ent. Soc. London, Proc., p. xxxvi. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 89. Wasmann, 1894, 'Verzeich. Myrmecoph. Termitoph. Arthrop.,' pp. 115 and 118. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134 (♃, ☿). Wasmann, 1896, Notes Leyden Mus., XVIII, p. 76. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 130 (♃, ☿, ♀). Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 203 and 204; 1915, Med. Göteborgs Mus. Zool. Afd., V, p. 42. Emery, 1916, Rev. Zool. Afr., IV, p. 246, figs. 9*a–b* (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 441, fig. 23 (♃, ☿, ♀).

Pheidole megacephala subsp. *capensis* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 34. Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 199. Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V. p. 72.

Type locality: Cape of Good Hope (Novara Expedition).

Cape Province: Willowmore (H. Brauns); Cape Town; Kimberley (E. Simon).

11_1. Var. **dregei** Emery, 1916, Rev. Zool. Afr., IV, p. 246, fig. 9a (♃). Arnold, 1920, Ann. South African Mus., XIV, p. 443 (♃).

Pheidole megacephala subsp. *dregei* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 34 (♃).

Type locality: Kimberley, Cape Province (E. Simon).

Transvaal: Makapan (E. Simon). Orange Free State: Bloemfontein (E. Simon). Portuguese East Africa: Delagoa Bay.

11_2. Var. **modestior** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 337 (♃, ☿).

Type locality: Majuba Neck, Cape Province (G. Arnold).

Natal.

11a. Subsp. **reddenburgensis** (Forel) Emery, 1916, Rev. Zool. Afr., IV, p. 246, fig. 9c (♃).

Pheidole (Allopheidole) cuitensis subsp. *reddenburgensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 135 (♃, ☿, ♀, ♂).

Pheidole cuitensis subsp. *reddenburgensis* Forel, 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 721.

Pheidole (Allopheidole) cuitensis subsp. *reddersburgensis* Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 450, fig. 26 (♃, ☿, ♀, ♂).

Type locality: Reddersburg, Orange Free State (H. Brauns).

12. **Pheidole clavata** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 114. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 89. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134.

Aphænogaster clavata Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 372 (☿).

Type locality: Keren, Bogos, Eritrea (Beccari).

13. **Pheidole concinna** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 362 (♃, ☿, ♀).

Type locality: Brazzaville, French Congo (A. Weiss).

14. **Pheidole crassinoda** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 32 (♃, ☿). Forel, 1894, Mitth. Schweiz. Ent. Ges., VIII, p. 94 (without description). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 12 (♃, ☿, ♀, ♂). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 253 (♃, ☿, ♀); in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 9 (♃, ☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 77 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 420 and 472 (♃, ☿).

Type locality: Makapan, Transvaal (E. Simon).

German Southwest Africa: Damaraland (Ganz); Okahandja (Casper); Herero. Bechuanaland: Lehututu (L. Schultze). Natal: Verulam (Weitzecker). Delagoa: (Liengme). German East Africa: Tanga (Alluaud and Jeannel); Kibonoto, Mt. Kilimanjaro; Ngare-na-Nyuki, Mt. Meru (Sjostedt). West Abyssinia: (Ilg).

14_1. Var. **pluto** Arnold, 1920, Ann. South African Mus., XIV, p. 473 (♃, ☿).

Type locality: Amatongas Forest, Portuguese East Africa (G. Arnold).

14a. Subsp. **ruspolii** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 597 (♃, ☿). Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 138 (☿, ♂). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 385 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 77 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 474 (♃, ☿, ♀, ♂), Pl. vi, figs. 63–66.

Pheidole crassinoda var. *ruspolii* Forel, 1904, Ann. Mus. Zool. Acad. Sc. St. Pétersbourg, VIII, (1903), p. 373 (♃).

Type locality: Giari Bule, Abyssinia (Ruspoli).

Somaliland: Arigalgalu (Ruspoli). Abyssinia: Ogaden (Ruspoli); Karssa (de Rothschild). Anglo-Egyptian Sudan: Godo Burka (Dmitriev). Belgian Congo: Kassenje, Lake Albert (Schubotz). British East Africa: Mbuyuni, Pori, 1100 m. (Alluaud and Jeannel). Rhodesia: Bulawayo (G. Arnold).

15. **Pheidole cuitensis** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 437 (♃, ☿); 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 721. Emery, 1916, Rev. Zool. Afr., IV, p. 246.

Type locality: Between the Cuito River and the Cubango River, Mossamedes (Baum and Van der Kellen).

16. **Pheidole escherichi** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 254 (♃, ☿, ♀).

Type locality: Ghinda, Eritrea (K. Escherich).

17. **Pheidole excellens** Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 744 (♃); 1863, ibid., XIII, p. 440. Roger, 1863, 'Verzeich. Formicid.,' p. 30. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 90. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 335 (☿).

Type locality: Gold Coast.

French Guinea: Kindia; Konakry (F. Silvestri). Slave Coast. Togo: Bismarckburg.

17*a*. Subsp. **rhodesiana** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 131 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 469 (♃, ☿, ♂), Pl. vi, fig. 69.

Type locality: Bulawayo, Rhodesia (G. Arnold).

17*b*. Subsp. **weissi** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 361 (♃); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 335 (♃, ☿).

Type locality: Brazzaville, French Congo (A. Weiss).

Nigeria: Lagos (E. Silvestri).

18. **Pheidole foreli** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 8 (♃, ☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 12 (♀). Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 199. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 241 (♃, ☿). Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, pp. 34, 45, and 73. Emery, 1916, Rev. Zool. Afr., IV, p. 245. Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 432 (♃, ☿, ♀).

Type locality: Sunday River Mts. (2400 ft.), near Port Elizabeth, Cape Province (H. Brauns).

Cape Province: Deep River near Cape Town in the Cape Flats (L. Schultze); Knysna (H. Brauns). Orange Free State: Bothaville; Reddersburg (H. Brauns). Natal: Estcourt (R. C. Wroughton).

18_1. Var. **pubens** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 12 (♃, ☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (☿, ♀, ♂). Arnold, 1920, Ann. South African Mus., XIV, p. 434 (♃, ☿).

Type locality: Natal (R. C. Wroughton; Haviland).

19. **Pheidole irritans** (Smith) Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 331, 332, and 371.

Myrmica irritans F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 127 (☿). Roger, 1863, 'Verzeich. Formicid.,' p. 33. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 433. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 110.

Type locality: Port Natal, Natal.

Cape Province: Nahoon River (Dixey and Longstaff). Natal: Colenso; Howick (Dixey and Longstaff).

20. **Pheidole jordanica** de Saulcy, 1874, Bull. Soc. Hist. Nat. Metz, XIII, p. 17 (♃, ☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 91. Emery, 1916, Rev. Zool. Afric., IV, p. 233, figs. 4a–c (♃, ☿).

Pheidole megacephala subsp. *jordanica* Emery, 1889, Ann. Mus. Civ. Genova, XXVII, p. 442 (♃, ☿).

Pheidole sinaitica Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 119 (*nec* Mayr).

Pheidole sinaitica subsp. *laticeps* Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicidæ,' p. 6 (♃, ☿) (not "*latifrons*" as quoted by Emery, 1916).

Pheidole schmitzi Forel, 1911, Rev. Suisse Zool., XIX, p. 455 (♃, ☿, ♀).

Pheidole sinaitica var. *laticeps* Karawaiew, 1911, Rev. Russe Ent., XI, p. 7 (♃, ☿).

Type locality: Jericho, Palestine (Piochard de la Brûlerie).

Cyrenaica, Egypt. Anglo-Egyptian Sudan: Khartum; Port Sudan (Karawaiew).

21. **Pheidole kitcheneri** Forel, emend.

Pheidole kitschneri Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (♃, ☿?). Arnold, 1920, Ann. South African Mus., XIV, p. 479 (♃, ☿?).

Pheidole kitscheneri Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 76 (♃, ☿, ♀).

Type locality: Mountains of Natal (R. C. Wroughton).

British East Africa: Cheteni; Fort Hall, Wa-Kikuyu, 1330 m.; Tchania River, 1520 m. (Alluaud and Jeannel).

22. **Pheidole kohli** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 11, footnote (♃, ☿). See p. 131.

Type locality: Waboniland, British East Africa.

Belgian Congo: Medje; Garamba (Lang and Chapin).

23. **Pheidole liengmei** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 93 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 134 (♃, ☿). Santschi, 1914, Med. Goteborgs Mus. Zool. Afd., III, p. 23 (☿). Reichensperger, 1915, ibid., V, p. 18. Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., pp. liii and lv. Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 465, fig. 30 (♃, ☿, ♀), Pl. vi, fig. 71.

Type locality: Delagoa, Portuguese East Africa (Liengme).

Zululand: Mkosi (I. Tragårdh). Rhodesia: Bulawayo; Rhodesia Falls (G. Arnold). German East Africa: Lindi (Lamborn).

23_1. Var. **malindana** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 135 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 468 (☿).

Type locality: Malindi, Southern Rhodesia (G. Arnold).

23_2. Var. **shinsendensis** Forel, 1913, Rev. Zool. Afr., II, p. 327 (☿).

Pheidole liengmei var. *shinsendensis* Bequaert, 1913, ibid., II, p. 426.

Pheidole liengmei var. *shinshendensis* Arnold, 1920, Ann. South African Mus., XIV, p. 468 (♃, ☿).

Type locality: Shinsenda, Belgian Congo (J. Bequaert).

Rhodesia: Bembesi (G. Arnold).

23a. Subsp. **micrartifex** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 215 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 463 (♃, ☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

24. **Pheidole maufei** Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 438, fig. 22a (♃, ☿).

Type locality: Belingwe, Southern Rhodesia (G. Arnold).

25. **Pheidole mayri** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 91 (♃, ☿).

Type locality: Senegal.

26. **Pheidole megacephala** (Fabricius) Roger, 1863, 'Verzeich. Formicid.,' pp. 30 and 49. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 441. Morris, 1880, American Naturalist, XIV, pp. 667–670. Forel, 1881, Mitth. München. Ent. Ver., V, p. 8 (☿). Lubbock, 1882, 'Ants, Bees and Wasps,' 5th Ed., pp. 20, 180, and 233 (☿), Pl. ii, figs. 3 and 4. Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 383, 385, and 386 (♃, ☿, ♀, ♂). Péringuey, 1886, Trans. Ent. Soc. London, Proc., p. xxxvi. Blackburn and Cameron, 1886, Mem. Manchester Lit. Phil. Soc., (3) X, p. 236. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 92. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 201. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 115, 116, 118, and 119. Mayr, 1896, Ent. Tidskr., XVII, p. 238. Wasmann, 1896, Notes Leyden Mus., XVIII, p. 76. Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 598 (☿). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 40. Wasmann, 1899, Deutsch. Ent. Zeitschr., p. 406. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 7. Wasmann, 1904, Notes Leyden Mus., XXV, p. 45. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 13. Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 332 and 336. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 370. Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 198. Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 203, 212, and 215. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 336 (☿, ♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 75 (♃, ☿, ♀); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (♃, ☿, ♀). Trägårdh, ibid., p. 41. Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 366. Emery, 1916, Rev. Zool. Afr., IV, pp. 235 and 238. Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 395. Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 2 (♃, ☿, ♀). See pp. 131 and 1018.

?*Formica edax* Forskål, 1775, 'Descr. Anim.,' p. 84.

Formica megacephala Fabricius, 1793, 'Ent. Syst.,' II, p. 361. Coquebert, 1799, 'Illustr. Iconogr. Ins.,' I, p. 26 (☿, ♀), Pl. vi, fig. 9. Latreille, 1802, 'Hist. Nat. Fourmis,' p. 232 (♀), Pl. x, fig. 67. Fabricius, 1804, 'Syst. Piez.,' p. 411.

Formica (Myrmica) trinodis Losana, 1834, Mem. Accad. Sc. Torino, XXXVII, p. 327, Pl. xxxvi, fig. 6.

Œcophthora pusilla Heer, 1852, 'Hausameise Madeiras,' p. 15 (♃, ☿, ♀, ♂), Pl. i, figs. 1–4. Brown, 1869, Proc. Boston Soc. Nat. Hist., XII, p. 211.

Myrmica? lævigata Smith, 1855, Trans. Ent. Soc. London, (2) III, p. 130 (☿), Pl. ix, figs. 7 and 8.

Myrmica trinodis Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 414, footnote (☿).

Myrmica (Pheidole) lævigata F. SMITH, 1858, 'Cat. Brit. Fossor. Hym.,' pp. 35 and 225 (☿).

Pheidole pusilla F. SMITH, ibid., p. 173, Pl. IX, figs. 18-20. MAYR, 1861, 'Europ. Formicid.,' p. 70 (♃, ☿, ♀); 1870, Verh. Zool. Bot. Ges. Wien, XX, pp. 981 and 984 (♃, ☿); in Fedtschenko, 1877, 'Voy. Turkestan, Formicid.,' p. 18, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, pp. 674 and 676 (♃, ☿). BLACKBURN and KIRBY, 1880, Ent. Monthly Mag., XVII, p. 89. MAYR, 1887, Verh. Zool. Bot. Ges. Wien, XXXVII, pp. 597 and 606 (♃, ☿).

Pheidole janus F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 175 (☿), Pl. IX, figs. 13-17. MAYR, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 360.

?*Œcophthora perniciosa* GERSTÆCKER, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 (☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 516 (☿).

Myrmica lævigata F. SMITH, 1859, Zoologist, XVII, p. 6385; 1862, Ent. Annual, p. 70 (☿, ♀), Pl., figs. 4, 7, 8.

Pheidole lævigata MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 747 (♃). WHITE, 1883, 'Ants and Their Ways,' p. 270 (☿).

?*Pheidole perniciosa* MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 441. ROGER, 1863, 'Verzeich. Formicid.,' p. 31. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 94.

Pheidole megacephala subsp. *pusilla* EMERY, 1916, Rev. Zool Afr., IV, pp. 235 and 239, fig. 1*a* (♃); 1919, ibid., VI, p. 170, fig. 5a (♃).

Pheidole megacephala var. *pusilla* SANTSCHI, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 2 (♃, ☿).

Type locality: MAURITIUS (= Isle de France).

Cosmopolitan in tropical and subtropical regions.

SENEGAMBIA: Dakar (F. Silvestri). CAMEROON: Sjöstedt). SAN THOMÉ: (de Seabra). FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: (Kohl); Malela; Matadi; Thysville; Boma (J. Bequaert); Zambi; Banana; Niangara; Akenge; Stanleyville (Lang and Chapin). ANGOLA: St. Paul de Loanda (F. Silvestri). CAPE PROVINCE: Cape Town (Raffray). NATAL: Stamford Hill (I. Trägårdh); Colenso (Dixey and Longstaff). ZULULAND: Junction of the Umfolosi Rivers (I. Trägårdh). TRANSVAAL: Johannesburg (Dixey and Longstaff). PORTUGUESE EAST AFRICA: Tete (Peters). GERMAN EAST AFRICA: Tanga; New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel); Kibonoto, Kilimanjaro; Usambara (Sjöstedt); Bagamoyo; Kibengo (Stuhlmann). ZANZIBAR: (Stuhlmann). BRITISH EAST AFRICA: Shimoni; Ramisi River; Naivasha, Rift Valley, 1900 m.; Nairobi; Port Florence, Kavirondo Bay (Alluaud and Jeannel). ABYSSINIA: Ogaden (Ruspoli); Harar (Kristensen). ANGLO-EGYPTIAN SUDAN: Abba Island, White Nile (I. Trägårdh).

26a. Subsp. **ilgi** (FOREL) EMERY, 1916, Rev. Zool. Afr., IV, pp. 236 and 244. See p. 132.

Pheidole rotundata subsp. *ilgi* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 82 (♃, ☿); 1907, Rev. d'Ent. Caen, XXVI, p. 139 (♃, ☿, ♀, ♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 128 (♃, ☿). REICHENSPERGER, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 191 and 195; 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 123. H. SCHMITZ, 1916, Zoolog. Meded. Mus. Leiden, II, p. 28, footnote. WASMANN, 1918, Tijdschr. v. Ent., LX, (1917), p. 395.

Pheidole rotundata subsp. *impressifrons* var. *ilgi* ARNOLD, 1920, Ann. South African Mus., XIV, pp. 417 and 427 (♃, ☿, ♀, ♂).

Type locality: Harar, ABYSSINIA (Ilg; Kristensen).

Abyssinia: Hiéka-Bourka; Karssa; Tchafianani; Kounhi; Adis-Abeba (de Rothschild); Diré Daua (Kristensen). Rhodesia: Bulawayo (G. Arnold). British East Africa: Fundu Island near Pemba (Voeltzkow). Belgian Congo: Lesse (J. Bequaert).

26*b*. Subsp. **impressifrons** Wasmann, 1905, Notes Leyden Mus., XXV, p. 110; 1911, Tijdschr. v. Ent., LIV, p. 199. Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 243, figs. 7*b* and *c* (♃, ☿).

Pheidole rotundata subsp. *impressifrons* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (♃, ☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 239 (♃, ☿); 1916, Rev. Suisse Zool., XXIV, p. 416 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 426 (♃, ☿, ♀).

Pheidole megacephala subsp. *impressiceps* Wasmann, 1904, Notes Leyden Mus., XXV, pp. 38, 41, 46, and 72, footnote (♃, ☿, ♀) (*nec* Mayr).

Pheidole punctulata subsp. *impressifrons* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 127 (♃, ☿, ♀); 1913, Rev. Zool. Afr., II, pp. 328 and 352 (☿). J. Bequaert, 1913, ibid., II, p. 427. Reichensperger, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 123. Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 396.

Pheidole rotundata var. *impressifrons* Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 443.

Pheidole punctatissima subsp. *impressifrons* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (♃, ☿). Trägårdh, ibid., p. 45. Reichensperger, 1915, ibid., V, pp. 10, 14, and 18.

Pheidole megacephala subsp. *punctulata* var. *impressiceps* Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (♃, ☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

Southern Nigeria: Lagos (Lamborn). Belgian Congo: (Kohl), Welgelegen (J. Bequaert). Rhodesia: Bulawayo (G. Arnold). Transvaal: Pretoria (F. Silvestri). Cape Province: Willowmore (H. Brauns). Natal: Mountains at 4000 ft. (Haviland). Zululand: Junction of Umfolozi (I. Trägårdh). Eritrea: Asmara (F. Silvestri). Abyssinia: Harar (Kristensen).

26*b*₁. Var. **atrocior** Santschi *in litt.* Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 243, fig. 7*d* (♃).

Type locality: Sierra Leone.

26*c*. Subsp. **melancholica** (Santschi) Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 280. Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 242, fig. 7a (♃, ☿). See p. 132.

Pheidole punctulata subsp. *melancholica* Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 164 (♃, ☿).

Pheidole punctulata var. *melancholica* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿, and mermithergate).

Type locality: Jacqueville, Ivory Coast (Lohier).

Gold Coast: Aburi (F. Silvestri). Belgian Congo: Garamba (Lang and Chapin); St. Gabriel (Kohl).

26*c*₁. Var. **angulata** (Stitz) Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 243 (♃).

Pheidole megacephala subsp. *punctulata* var. *angulata* Stitz, 1911, 'Wiss. Ergebn. Deutsch Zentr. Afr. Exp. (1907–08),' III, p. 385 (♃, ☿).

Type locality: Lake Mohasi, east of Lake Kivu, German East Africa (Schubotz).

26*c*$_2$. Var. **costauriensis** (Santschi) Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 243, fig. 7a (♃).

Pheidole rotundata subsp. *costauriensis* Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 433 (♃); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 250 (☿).

Type locality: Winnebah, Gold Coast.

French Guinea: Kindia; Kakoulima (F. Silvestri). Southern Nigeria: Ibadan (F. Silvestri).

26*d*. Subsp. **nkomoana** Forel, 1916, Rev. Suisse Zool., XXIV, p. 415 (♃, ☿, ♀, ♂).

Type locality: St. Gabriel, Belgian Congo (Kohl).

26*e*. Subsp. **punctulata** (Mayr) Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 94. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 117. Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 311. Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 62 (♃). Forel, in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564. Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 199. Emery, 1916, Rev. Zool. Afr., IV, pp. 235 and 241, figs. 6a and 6c (♃, ☿). See pp. 132 and 1019.

Pheidole punctulata Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 899 (♃). Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 270; 1892, Ann. Soc. Ent. France, LX, (1891), p. 563. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 95. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 4 (♃). Wasmann, 1896, Notes Leyden Mus., XVIII, p. 76. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 40. Wasmann, 1907, Deutsch. Ent. Zeitschr., p. 149. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81; 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (♃, ☿). F. C. Wellman, 1908, Ent. News, XIX, p. 230. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 53, 59, and 65 (♃, ☿); 1910, ibid., LIV, p. 441; 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (♃, ☿, ♀); 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 180; 1913, Rev. Zool. Afr., II, p. 328 (♃, ☿). Bequaert, ibid., p. 426. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (♃, ☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 240 (♃, ☿, ♀, ♂). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 76 (♃, ☿). Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, p. 20. Wasmann, 1920, Tijdschr. v. Ent., LXII, (1919), p. 128. Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 420 (♃, ☿, ♀, ♂), Pl. vi, fig. 67. J. Hewitt, 1920, South African Journ. Nat. Hist., II, p. 109.

Pheidole talpa Gerstäcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 356 (♃); 1873, 'in v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 360 (♃), Pl. xiv, fig. 11.

Pheidole megacephala var. *punctulata* Wasmann, 1898, Wien. Ent. Zeitg., XVII, p. 103; 1899, Notes Leyden Mus., XXI, p. 50. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 14. Reichensperger, 1915, 'Med. Göteborgs Mus. Zool. Afd., V, pp. 37, 38, 41, 46, and 53.

Type locality: Caffraria.

French Guinea: Mamou (Silvestri). Ivory Coast: Assinie (C. Alluaud). French Congo: Ogowe (Mocquerys). Portuguese Congo: Conde; Landana (Petit); Shiloango (Tschoffen). Belgian Congo: Lower Congo (Salon); Kasai, Kondué (Luja); Leopoldville; Elisabethville; Kasenga; Bukama; Lukonzolwa (J. Bequaert); Panana (Busschodts); Kinshasa (Waelbroeck); Banana to Boma (Tschoffen); Kisantu (Goossens); Mayombe (de Briey; Luja); Kiniati; Congo da Lemba (Luja); Boma; Zambi; Banana; Bolobo; Stanleyville; Ngayu; Avakubi; Niapu; Faradje; Garamba (Lang and Chapin); Tua (J. Maes). Angola: St. Paul de Loanda (F. Silvestri). Benguela: (C. Wellman). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). Rhodesia: Bulawayo (G. Arnold). Transvaal: Pretoria. Cape Province: Lower Albany; Grahamstown (Hewitt); Port Elizabeth (H. Brauns). Natal: Durban (G. Arnold and L. Bevis). Portuguese East Africa: Delagoa Bay (Liengme); Mozambique. Zanzibar: (Ville). German East Africa: Kibonoto, Mt. Kilimanjaro (Sjostedt); Marangu, Mt. Kilimanjaro, 1800 m. (Alluaud and Jeannel); Amani (H. Prell); Mbaramu (v. d. Decken); Moschi (Zimmer). British East Africa: Chake Chake, Pemba Island (Voeltzkow), Nairobi, 1660 m. (Alluaud and Jeannel). Uganda: Entebbe (Schultze). Abyssinia: Let Marefia, Schoa (Antinori). Eritrea: Ghinda (Belli).

26e_1. Var. **atrox** (Forel) Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 241, figs. 7*b* and *d* (♃).

Pheidole punctulata subsp. *atrox* Forel, 1913, ibid., II, p. 328 (♃, ☿, ♀). Bequaert, ibid., p. 426. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 126 (♃, ☿, ♀). Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 395.

Pheidole punctatissima subsp. *atrox* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (♃, ☿, ♀). Trägårdh, ibid., p. 44. Reichensperger, 1915, ibid., V, p. 18.

Pheidole punctulata var. *atrox* Arnold, 1920, Ann. South African Mus., XIV, p. 424 (♃, ☿, ♀, ♂).

Pheidole inquilina ? Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 240 (mermithergate!). Arnold, 1920, Ann. South African Mus., XIV, 425 (recognizes its true nature as a mermithergate and found it in the nests of *P. megacephala punctulata* var. *atrox*).

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

Belgian Congo: Bukama (J. Bequaert). Rhodesia: Bulawayo (G. Arnold). Zululand: Junction of the Umfolosi Rivers (I. Trägårdh). Natal: Durban, Amanzimtoti (I. Trägårdh).

26e_2. Var. **speculifrons** (Stitz) Emery, 1916, Rev. Zool. Afr., IV, pp. 236 and 242 (♃).

Pheidole megacephala var. *speculifrons* Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 386 (♃, ☿) (*nec Pheidole speculifrons* Dalla Torre, 1893).

Type locality: Bukoba, Victoria Nyanza, German East Africa (Schubotz).

26*f*. Subsp. **rotundata** (Forel) Emery, 1916, Rev. Zool. Afr., VI, pp. 236 and 244 (♃, ☿).

Pheidole rotundata Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 92 (♃, ☿). Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 34. Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 239 (♃, ☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 76 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 425, fig. 21 (♃, ☿, ♂).

Type locality: DELAGOA (Liengme).

MOSSAMEDES: between the Cubango and Cuito Rivers (Baum and Van der Kellen). TRANSVAAL: Pretoria (E. Simon; F. Silvestri). NATAL: Durban (G. Arnold). RHODESIA: Livingstone; Chirinda Forest (G. Arnold). GERMAN EAST AFRICA: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). BRITISH EAST AFRICA: Nairobi, Kikuyu (Alluaud).

27. **Pheidole mentita** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 338 (♃, ☿).

Type locality: Kindia, FRENCH GUINEA (F. Silvestri).

27_1. Var. **pullata** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 339 (♃, ☿).

Type locality: Camayenne, FRENCH GUINEA (F. Silvestri).

28. **Pheidole minima** MAYR, 1900, Ent. Tidskr., XXI, p. 275 (♃, ☿).

Type locality: Mungo River, CAMEROON (R. Buchholz).

28_1. Var. **catella** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 339 (♃, ☿).

Type locality: Olokemeji, SOUTHERN NIGERIA (F. Silvestri).

GOLD COAST: Aburi (F. Silvestri).

28*a*. Subsp. **corticicola** SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 366 (♃, ☿, ♀, ♂).

Type locality: Brazzaville, FRENCH CONGO (A. Weiss).

FRENCH CONGO: Mindouli; Gomba (A. Weiss).

28*b*. Subsp. **faurei** SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 15 (☿, ♀).

Type locality: Samkita, FRENCH CONGO (F. Faure).

28*c*. Subsp. **malelana** WM. M. WHEELER. See p. 133 (♃, ☿).

Type locality: Malela, BELGIAN CONGO (Lang and Chapin).

29. **Pheidole mylognatha** WM. M. WHEELER. See p. 134 (♃, ☿).

Type locality: Banana, BELGIAN CONGO (Lang and Chapin).

30. **Pheidole niapuana** WM. M. WHEELER. See p. 136 (♃, ☿).

Type locality: Niapu, BELGIAN CONGO (Lang and Chapin).

31. **Pheidole nigeriensis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 340 (♃).

Type locality: Olokemeji, SOUTHERN NIGERIA (F. Silvestri).

32. **Pheidole njassæ** VIEHMEYER, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 35 (♃, ☿).

Type locality: Manow, Langenburg, GERMAN EAST AFRICA.

32_1. Var. **legitima** (SANTSCHI).

Pheidole njassæ var. *sculptior* VIEHMEYER, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 36 (♃, ☿). (*nec P. flavens* var. *sculptior* Forel, 1893).

Pheidole njassæ var. *legitima* SANTSCHI, 1916, Bull. Soc. Ent. France, p. 242.

Type locality: Khutu Steppe, Morogoro, GERMAN EAST AFRICA (K. Schwartze).

33. **Pheidole occipitalis** ERN. ANDRÉ, 1890, Rev. d'Ent. Caen, IX, p. 321 (♃, ☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 93.

Type locality: SIERRA LEONE (Mocquerys).

33*a*. Subsp. **neutralis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 336 (♃, ☿).

Type locality: Camayenne, FRENCH GUINEA (F. Silvestri).

34. **Pheidole ? pallidelutea** (Latreille) Roger, 1863, 'Verzeich. Formicid.,' p. 30. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 94.

Formica pallidelutea Latreille, 1802, 'Hist. Nat. Fourmis,' p. 241 (☿). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 418.

Type locality: Senegal.

35. **Pheidole philippi** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 8 (♃, ☿).

Type locality: Ghinda, Eritrea (F. Silvestri).

36. **Pheidole picata** (Forel) Emery, 1916, Rev. Zool. Afr., IV, p. 245, fig. 8*b* (♃, ☿). See p. 1019.

Pheidole punctulata var. *picata* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 370.

French Congo: Brazzaville (A. Weiss).

37. **Pheidole prelli** Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (♃, ☿, ♀, ♂).

Type locality: Mombasa, British East Africa (H. Prell).

37a. Subsp. **redbankensis** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 128 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 434, fig. 22 (♃, ♀).

Type locality: Bulawayo, Rhodesia (G. Arnold). This is the locality given by Forel; Arnold (1920) corrects it to Redbank, Southern Rhodesia.

37a$_1$. Var. **politocciput** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 503 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 436 (♃, ☿, ♀, ♂).

Type locality: Victória Falls, Rhodesia (G. Arnold).

Rhodesia: Bulawayo (G. Arnold).

38. **Pheidole pulchella** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 360 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

39. **Pheidole rugaticeps** Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 375 (♃, ☿, ♀). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245 (☿); 1884, Ann. Mus. Civ. Genova, XXI, p. 542 (☿). Emery, 1892, ibid., XXXII, p. 112 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 253 (♃, ☿, ♀). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (♃, ☿).

Type locality: Sciotel, Eritrea (Beccari).

Eritrea: Ghinda (K. Escherich; F. Silvestri). Somaliland: Obbia (Bricchetti-Robecchi); Sinadogo; Erdal (Pavesi). Anglo-Egyptian Sudan: El Hefera, Settit (Magretti). Arabia: Yemen.

39*a*. Subsp. **arabs** (Emery) Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 253 (♃). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 336.

Pheidole rugaticeps var. *arabs* Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 535 (♃, ☿, ♀).

Type locality: Tes, southern Arabia (Doria and Beccari).

Eritrea: Ghinda (K. Escherich). Senegambia: Dakar; Thiès (F. Silvestri).

40. **Pheidole saxicola** Wm. M. Wheeler. See p. 138 (♃, ☿).

Type locality: Zambi, Belgian Congo (Lang, Chapin and Bequaert).

Belgian Congo: Boma (J. Bequaert).

41. **Pheidole scabriuscula** Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 356 (☿); 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 360 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika.' IV, Hym., p. 40.

Type locality: Ndara, British East Africa (v. d. Decken).

42. **Pheidole schoutedeni** Forel, 1913, Rev. Zool. Afr., II, p. 329 (♃, ☿). Bequaert, ibid., p. 427.

Type locality: Welgelegen, Belgian Congo (J. Bequaert).

42_1. Var. **platycephala** (Stitz) Arnold, 1920, Ann. South African Mus., XIV, p. 450.

Pheidole platycephala Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp., 1910–11,' I, p. 380, fig. 3 (♃, ☿).

Type locality: Libenge, Belgian Congo (Schubotz).

43. **Pheidole schultzei** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 9, fig. 1 (♃, ☿, ♀, ♂). Arnold, 1920, Ann. South African Mus., XIV, p. 457 (♃, ☿, ♀, ♂).

Pheidole schulzei Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (♃, ☿).

Type locality: Between Kooa and Sekgoma, Bechuanaland (L. Schultze).

Bechuanaland: Between Kgokong and Kang (L. Schultze). Rhodesia: Victoria Falls (R. C. Wroughton).

43_1. Var. **gwaaiensis** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 129 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 458, fig. 28 (♃, ☿, ♀, ♂).

Type locality: Gwaai, Rhodesia (G. Arnold).

44. **Pheidole sculpturata** Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 897 (♃). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 31 (♃, ☿); 1900, Bull. Soc. Ent. Italiana, XXXII, p. 114, fig. 8 (♃). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 361 (♃, ☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 9 (♃); 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 461, fig. 29 (♃, ☿).

Type locality: Caffraria.

French Congo: Gomba; Mandouga; Mbamu (A. Weiss). German Southwest Africa: (Lubbert); Okahandja (Casper). Transvaal: Pretoria (E. Simon; Lounsbury). Orange Free State: Bloemfontein (E. Simon); Bothaville (H. Brauns). Natal: (R. C. Wroughton; Haviland).

44_1. Var. **areolata** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 269 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 463 (♃, ☿).

Type locality: Bothaville, Orange Free State (H. Brauns).

44*a*. Subsp. **berthoudi** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 89 (♃, ☿); 1910, Ann. Soc. Ent. Belgique, LIII, p. 65 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 361 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 463 (♃, ☿).

Type locality: Valdezia, Transvaal (P. Berthoud).

French Congo: Gomba; Mandouga; Mbamu (A. Weiss). Benguela: (Wellman).

44*b*. Subsp. **dignata** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 250 (♃, ☿).

Type locality: Gomba, French Congo (A. Weiss).

French Congo: Mandouga (A. Weiss).

44*c*. Subsp. **katonæ** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 21 (☿).

Type locality: Boma Gombe, German East Africa (Katona).

44*d*. Subsp. **welgelegenensis** Forel, 1913, Rev. Zool. Afr., II, p. 327 (♃, ☿). Bequaert, ibid., p. 426. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (♀).

Type locality: Welgelegen, Belgian Congo (J. Bequaert).

Belgian Congo: Nieuwdorp (Leplae).

44*e*. Subsp. **zambesiana** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 133 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 464 (♃, ☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

Rhodesia: Shiloh (G. Arnold).

45. **Pheidole sinaitica** Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 745 (♃); 1863, ibid., XIII, p. 441. Roger, 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 675 (♃). Ern. André, 1881, Ann. Soc. Ent. France, (6) I, p. 73; 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 383 and 384 (♃, ☿). Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 542 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 94. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicidæ,' p. 6 (♃, ☿). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 253 (♃, ☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 3 (♃, ☿); 1916, Rev. Zool. Afric., IV, p. 234, figs. 4*d* and *e*.

Pheidole synaitica Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245 (♀).

Type locality: Sinai Peninsula (v. Frauenfeld).

Eritrea: Ghinda (K. Escherich); Nefasit (K. Escherich; F. Silvestri). Southern Abyssinia: (Ilg). Anglo-Egyptian Sudan: Atbara River; Sebderat (Magretti).

46. **Pheidole speculifera** Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 373 (♃, ☿). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245 (☿); 1884, Ann. Mus. Civ. Genova, XXI, p. 542 (☿). Emery, 1895, ibid., XXXV, p. 178 (♃). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 253 (♃, ☿); 1913, Rev. Suisse Zool., XXI, p. 668 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 77 (☿). See p. 140.

Pheidole speculifrons Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96.

Type locality: Anseba, Eritrea (Beccari).

Belgian Congo: Faradje; Garamba (Lang and Chapin). Cameroon: Johann-Albrechtshöhe (Conradt). British East Africa: Mt. Kenia, Amboni River, 1800 m. (Alluaud and Jeannel). Abyssinia: Arussi Galla, Ganale Gudda (V. Bottego). Eritrea: Ghinda; Melelia (K. Escherich). Anglo-Egyptian Sudan: Bahr-el-Salaam (Magretti).

46_1. Var. **ascarus** Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 62 (♃). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 77 (♃, ☿).

Type locality: Ghinda, Eritrea (Belli).

British East Africa: Nairobi, 1600 m. (Alluaud and Jeannel).

46_2. Var. **cubangensis** Forel, 1916, Rev. Suisse Zool., XXIV, p. 413 (♃).

Pheidole crassinoda var. *cubangensis* Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 306 (♃).

Pheidole crassinoda var. *kubangensis* Forel, in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 561 (♃).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

Belgian Congo: near Lisala, above Nouvelle Anvers (Kohl).

47. **Pheidole spinulosa** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 438 (♃, ☿, ♀, ♂). Emery, 1916, Rev. Zool. Afr., IV, p. 250 (♃). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 453 (♃, ☿, ♀, ♂).

Type locality: Basutoland (R. C. Wroughton).

47*a*. Subsp. **conigera** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 440 (♃).

Type locality: South Africa (Wood Mason).

47*b*. Subsp. **messalina** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 440 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 454 (♃, ☿).

Type locality: Basutoland (R. C. Wroughton).

47b_1. Var. **nexa** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 129 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 455, fig. 27 (♃, ☿, ♀), Pl. vi, fig. 70.

Type locality: Rhodesia (G. Arnold).

Rhodesia: Bulawayo; Plumtree (G. Arnold).

47b_2. Var. **poweri** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 241 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 457 (♃, ☿).

Type locality: Kimberley, Cape Province (Power).

48. **Pheidole squalida** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 364 (♃, ☿).

Type locality: Brazzaville, French Congo (A. Weiss).

49. **Pheidole strator** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 256 (♃, ☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 76 (♃, ☿). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 366.

Type locality: Ghinda, Eritrea (K. Escherich).

British East Africa: Shimoni; Blue Post Hotel, Kikuyu, 1520 m. (Alluaud and Jeannel).

49*a*. Subsp. **fugax** Arnold, 1920, Ann. South African Mus., XIV, pp. 418 and 449, fig. 25a (♃, ☿).

Type locality: Amatongas Forest, Portuguese East Africa (G. Arnold).

50. **Pheidole teneriffana** Forel, 1893, Ann. Soc. Ent. Belgique, XXXVII, p. 465 (♃, ☿). Emery, 1916, Rev. Zool. Afr., IV, p. 259. Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 378.

Pheidole tenerifana Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 61 (♃).

Type locality: Laguna, Teneriffe, Canary Islands (Medina).

British East Africa: Mombasa (G. Arnold). Eritrea: Massaua (Belli).

51. **Pheidole tenuinodis** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 10 (♃, ☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 12 (♃, ☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 127 (♃, ☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 215 (♃, ☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 337 (♃, ☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (☿). Emery, 1916, Rev. Zool. Afr., IV, p. 245. Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 428 (♃, ☿, ♀).

Type locality: Bothaville, Orange Free State (H. Brauns).

Cape Province: Ladismith (H. Brauns); Kirstenbosch near the Cape (F. Silvestri). Natal: Pinetown (I. Trägårdh). Rhodesia: Matoppo Hills (G. Arnold). German Southwest Africa: Okahandja (Casper); Grootfontein (von Erffer); Rooibank (L. Schultze). Bechuanaland: Between Kooa and Thopane (L. Schultze).

51_1. Var. **sipapomæ** Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 430 (♃, ☿).

Type locality: Sipapoma, Umgusa River, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Victoria Falls (G. Arnold).

51a. Subsp. **bothæ** (Forel) Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (♃, ☿, ♀).

Pheidole foreli subsp. *bothæ* Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 62 (♃, ☿).

Type locality: Bothaville, Orange Free State (H. Brauns).

Natal: Van Reenen, Balgowan (F. Silvestri).

52. **Pheidole termitophila** Forel, in Wasmann, 1904, 'Termitophilen aus dem Sudan, Res. Swed. Zool. Exped. Jägerskiöld,' XIII, p. 13 (♃, ☿, ♀). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 339 (♃).

Type locality: Kaka on the Ghrab el Aish, White Nile, Anglo-Egyptian Sudan (I. Trägårdh).

Senegambia: Dakar (F. Silvestri).

52a. Subsp. **liberiensis** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 270 (♃, ☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 339 (♃, ☿).

Type locality: Golah, Liberia.

French Guinea: Mamou; Kakoulima (F. Silvestri).

53. **Pheidole tricarinata** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 340 (♃).

Type locality: Camayenne, French Guinea (F. Silvestri).

54. **Pheidole vanderveldi** Forel, 1913, Rev. Zool. Afr., II, p. 326 (♃, ☿). Bequaert, ibid., p. 426. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 23 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 481 (♃, ☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Natal: Durban (I. Trägårdh).

55. **Pheidole ? variolosa** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 113 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 97.

Type locality: Mogadiscio, Somaliland (Bricchetti-Robecchi).

Somaliland: Obbia (Pavesi).

56. **Pheidole victoris** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 127 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 417 and 430 (♃, ☿).

Type locality: Malindi, Southern Rhodesia (G. Arnold).

57. **Pheidole xocensis** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 419 and 443, fig. 24 (♃, ☿), Pl. vi, fig. 68.

Type locality: Xoce River, Southern Rhodesia (G. Arnold).

57_1. Var. **bulawayensis** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 215 (♃, ☿). Arnold, 1920, Ann. South African Mus., XIV, p. 445 (♃, ☿).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Melissotarsini Emery

Melissotarsus Emery

Melissotarsus Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 378.

Genotype: *Melissotarsus beccarii* Emery, 1877.

1. **Melissotarsus beccarii** Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 379, fig. (♀, ☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 74. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 243 (☿, ♀, ♂). Arnold, 1916, Ann. South African Mus., XIV, p. 188 (☿, ♀, ♂), Pl. v, figs. 51, 51a, 51*b*.

Type locality: Keren, Eritrea (Beccari).

Natal: Durban (Marley; C. B. Cooper).

2. **Melissotarsus emeryi** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 133 (☿).

Type locality: near the Colba River, Abyssinia (de Rothschild).

2*a*. Var. **pilipes** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 71 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 342 (☿).

Type locality: Taveta, British East Africa (Alluaud and Jeannel).

Senegambia: Thiès (F. Silvestri). German East Africa: Bismarckhügel, Mt. Kilimanjaro (Alluaud and Jeannel).

3. **Melissotarsus major** Santschi, 1919, Rev. Zool. Afr., VII, p. 85 (☿).

Type locality: Penge, Belgian Congo (J. Bequaert).

4. **Melissotarsus weissi** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 356, fig. 3 (♀).

Type locality: Brazzaville, French Congo (A. Weiss).

Myrmicariini Emery

Myrmicaria W. Saunders

Myrmicaria W. Saunders, 1841, Trans. Ent. Soc. London, III, p. 57.

Physatta F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 171.

Heptacondylus F. Smith, ibid., p. 141.

Genotype: *Myrmicaria brunnea* W. Saunders, 1841.

1. **Myrmicaria baumi** Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 307 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 562 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♀, ♂). Stitz, 1911, Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 383, fig. 5 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 266 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

German Southwest Africa: (Lubbert). Bechuanaland: Kooa; Severelela to Khakhea (L. Schultze).

2. **Myrmicaria eumenoides** (Gerstæcker) Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 905 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 155. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 83. Mayr, 1896, Ent. Tidskr., XVII, p. 249. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 42. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 62 (☿). Sjostedt, 1904, 'I Västafrikas Urskogar,' p. 507. Wasmann, 1907, Deutsch. Ent. Zeitschr., p. 151. Mayr, in Sjostedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 17. Forel, 1910, Ann. Soc. Ent. Belgique, LIV,

p. 446 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 133 (☿, ♀, ♂). Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 201. Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907-08,)' III, p. 385, fig. 5 (☿, ♀, ♂). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿, ♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 116 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 34 (☿, ♀). Trägårdh, ibid., p. 45. Arnold, 1914, Proc. Rhodesia Sc. Assoc., XIII, p. 25. H. Brauns, ibid., pp. 34, 36, 38, and 39. Forel, 1916, Rev. Suisse Zool., XXIV, p. 404 (☿, ♀). Arnold, 1916, Ann. South African Mus., XIV, p. 263 (☿, ♀, ♂), Pl. vii, figs. 87, 87*a*, 89*a*, and 89*b*. Wasmann, 1918, Tijdschr. v. Ent., LX, (1917) p. 394.

Heptacondylus eumenondes Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 (♀); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 514 (♀). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 423. Roger, 1863, 'Verzeich. Formicid.,' p. 28. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 356; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 358 (☿). Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 198.

Physatta natalensis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 172 (♀).

Heptacondylus sulcatus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 756 (☿); 1863, ibid., XIII, p. 423. Roger, 1863, 'Verzeich. Formicid.,' p. 28.

Heptacondylus natalensis Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 423. Roger, 1863, 'Verzeich. Formicid.,' p. 27.

Myrmicaria fodiens subsp. *eumenoides* Emery, 1893, Rev. Suisse Zool., I, p. 219; 1895, Ann. Soc. Ent. France, LXIV, p. 42.

Myrmicaria fodiens var. *eumenoides* Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 214 (☿).

Type locality: Tete, Portuguese East Africa (Peters).

Cameroon: Bibundi (Tessmann). Spanish Guinea: Alen (Tessmann). Belgian Congo: Congo da Lemba (Luja); Romée near Stanleyville (Kohl), Kasindi; primary forest W. of Mt. Ruwenzori; Ituri; Aruwimi; Kwidjwi Island (Schubotz). Southern Rhodesia: (G. Arnold). Angola: (Welwitsch). German Southwest Africa: (Lübbert). Bechuanaland: Lehututu to Kang; Kooa (L. Schultze). Basutoland. Transvaal: Barberton (Rendall); Valdezia (P. Berthoud); Makapan; Pretoria; Hamman's Kraal (E. Simon). Natal: Stamford Hill; Amanzimtoti (I. Tragårdh); Durban (G. Arnold). Delagoa: (Liengme; A. Müller). German East Africa: Mombo, Usambara (Sjöstedt); Bondei (C. W. Schmidt). British East Africa: Mombasa (v. d. Decken). Uganda: Ibanda; Mitiana; Butiti; Nakitawa (Duke of Abruzzi). Zanzibar: (A. Voeltzkow).

2₁. Var. **fusca** Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907-08),' III, p. 385 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 116 (☿).

Type locality: Boga, north of Mt. Ruwenzori, Belgian Congo (Schubotz).

2*a*. Subsp. **occidentalis** Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 3, footnote (☿).

Type locality: Dimbroko, Ivory Coast (Le Moult).

2*b*. Subsp. **opaciventris** (Emery) Forel, 1911, Rev. Zool. Afr., I, p. 276; 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 116 (☿). See p. 143.

Myrmicaria opaciventris Emery, 1893, Rev. Suisse Zool., I, p. 221 (☿, ♀, ♂). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 4 (☿, ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391 (☿, ♀, ♂). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (♀); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 263 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 133 (☿).

Myrmicaria eumenoides var. *opaciventris* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 393 (☿, ♀).

Type locality: Benguela (Buchner).

Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Cameroon: Mundame (Conradt); Yaunde (Zenker). French Congo: Ogowe (Mocquerys); Brazzaville; Madingu (A. Weiss). Belgian Congo: Leopoldville (Dubois); Duma; Libenge (Schubotz); Kimuenza (Schultze); Kimpoko (Buttner); Dungu to Niangara, village of Denge (Hutereau); Malela; Thysville; Stanleyville; Avakubi; Medje; Akenge; Bafwabaka; Ngayu; Faradje (Lang and Chapin); Walikale to Lubutu (J. Bequaert); Yakuluku (J. Rodhain). Uganda: (Benoit). West Abyssinia: (Ilg).

$2b_1$. Var. **congolensis** (Forel). See p. 146.

Myrmicaria eumenoides var. *congolensis* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 59 (☿); 1910, ibid., LIV, p. 421; 1911, Rev. Zool. Afr., I, p. 276 (☿, ♀); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 362 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿, ♂); 1913, Rev. Zool. Afr., II, p. 337; 1916, Rev. Suisse Zool., XXIV, p. 404. Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 135; 1918, Tijdschr. v. Ent., LXI, p. 80.

Myrmicaria eumenoides subsp. *congolensis* J. Bequaert, 1913, Rev. Zool. Afr., II, p. 429. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 342 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 115 and 116 (☿, ♀).

Type locality: Lower Congo (in stomach of *Manis temmincki*; Solon).

Cameroon: Victoria (F. Silvestri); Soppo (v. Rothkirch). Belgian Congo: Kondué (Luja); Welgelegen; Kisantu (J. Bequaert); Lukula (Daniel); Mafungu; Congo da Lemba; Kiniati; Banza Masola (R. Mayné); Mayombe (de Briey). German East Africa: Amani (Zimmer); Kigali, near Issawe (Zimmer). Uganda: Chacansengula to Kasengui (Bayer); Buzubizi; Unyoro Province, Region of Mubende, Lake Albert; Mt. Ruwenzori, Ibanda, 1400 m. (Alluaud). British East Africa: Mombasa (H. Prell).

$2b_2$. Var. **consanguinea** (Santschi).

Myrmicaria eumenoides subsp. *congolensis* var. *consanguinea* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 115, 116 (☿, ♀).

Type locality: Likoni, British East Africa (Alluaud and Jeannel).

British East Africa: Tiwi; Gazi; River Ramisi; Blue Post Hotel, Kikuyu (Alluaud and Jeannel).

$2b_3$. Var. **crucheti** (Santschi). See p. 146.

Myrmicaria eumenoides subsp. *congolensis* var. *crucheti* Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 311 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 116 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

German East Africa. Belgian Congo: Leopoldville; Stanleyville; Avakubi; Ngayu (Lang and Chapin). Cameroon: Metit (Schwab).

3. **Myrmicaria exigua** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 320 (☿, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 155. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134. Forel, 1916, Rev. Suisse Zool., XXIV, p. 404.

Type locality: Sierra Leone (Mocquerys).

Cameroon: (H. Brauns). Belgian Congo: (Kohl). French Congo: Gaboon.

3_1. Var. **gracilis** (Stitz) Santschi, 1920, Rev. Zool. Afr., VIII, p. 120.

Myrmicaria gracilis Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 133 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 445 (☿).

Type locality: Bibundi, Cameroon (Tessmann).

Cameroon: (L. v. Muralt).

3_2. Var. **obscura** Santschi, 1920, Rev. Zool. Afr., VIII, p. 120 (☿).

Type locality: Luali, Belgian Congo (J. Bequaert).

3_3. Var. **pulla** Santschi, 1920, Rev. Zool. Afr., VIII, p. 119 (♀).

Type locality: Yambuya, Belgian Congo (J. Bequaert).

3_4. Var. **rufiventris** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 345 (☿); 1916, Rev. Suisse Zool., XXIV, p. 404 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Lumaliza; Makanga; Batiamponde (Kohl).

3*d*. Subsp. **kisangani** Wm. M. Wheeler. See p. 148 (☿).

Type locality: Stanleyville, Belgian Congo (Lang and Chapin).

4. **Myrmicaria lævior** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 445 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 267 (☿).

Type locality: Natal (Haviland).

5. **Myrmicaria nigerrima** Arnold, 1916, Ann. South African Mus., XIV, p. 270 (☿), Pl. vii, fig. 92.

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

6. **Myrmicaria nigra** (Mayr) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 155. Emery 1895, Ann. Soc. Ent. France, LXIV, p. 42. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 446 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 269 (☿, ♂), Pl. vii, fig. 91.

Heptacondylus niger Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 755 (☿); 1863, ibid., XIII, p. 423. Roger, 1863, 'Verzeich. Formicid.,' p. 27. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 110 (☿).

Type locality: Cape of Good Hope (Novara Exped.).

Cape Province: Cape Town (E. Simon); Montagu Pass (H. Brauns). Natal: at 5500 ft. (R. C. Wroughton).

7. **Myrmicaria nitida** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 133 (☿).

Type locality: Duala, Cameroon (Schäfer).

Spanish Guinea: Nkolentanga (Tessmann).

According to Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 421, this cannot be separated from *M. eumenoides* subsp. *opaciventris* var. *congolensis* (Forel).

7_1. Var. **fumata** Santschi, 1916, Bull. Soc. Ent. France, p. 242.

Myrmicaria nitida var. *brunnea* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 254 (♀) (*nec Myrmicaria brunnea* Saunders).

Type locality: Near Dimbroko, Ivory Coast (Posth).

8. **Myrmicaria salambo** Wm. M. Wheeler. See p. 147 (☿).

Type locality: Garamba, Belgian Congo (Lang and Chapin).

9. **Myrmicaria striata** Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 382, fig. 5 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 337 (☿). Bequaert, ibid., p. 429. Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 212 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 267 (☿, ♀, ♂), Pl. vii, figs. 90a, *b*, *c*.

Myrmicaria striatula Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 116 (☿).

Type locality: Bukoba, Victoria Nyanza, German East Africa (Schubotz).

Belgian Congo: Elisabethville (J. Bequaert). Southern Rhodesia: Bembesi; Plumtree; Bulawayo (G. Arnold). German East Africa: Kibosho, Mt. Kilimanjaro (C. Alluaud).

9_1. Var. **verticalis** Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' p. 3, footnote (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

9a. Subsp. **buttgenbachi** Forel, 1913, Rev. Zool. Afr., II, p. 337 (☿).

Type locality: not given; probably Katanga Region, Belgian Congo (Buttgenbach).

9*b*. Subsp. **insularis** Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' p. 2 (☿, ?♂).

Type locality: San Thomé (de Seabra).

10. **Myrmicaria tigreënsis** (Guérin) F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 141. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 436. Roger, 1863, 'Verzeich. Formicid.,' pp. 28 and 48. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 156.

Myrmica tigreënsis Guérin, in Lefebvre, 1848, 'Voy. Abyssinie,' IV, Zool., pt. 6, p. 351 (♂), Pl. vii, fig. 7.

Type locality: Abyssinia.

Cardiocondylini Emery

Cardiocondyla Emery

Cardiocondyla Emery, 1869, Ann. Accad. Natural. Napoli, (2) II, p. 20.

Emeryia Forel, 1890, Ann. Soc. Ent. Belgique, XXXIV, C. R., p. cx (♂).

Genotype: *Cardiocondyla elegans* Emery, 1869.

1. **Cardiocondyla emeryi** Forel, 1881, Mitth. München. Ent. Ver., V, p. 5 (☿). Ern. André, 1881, Ann. Soc. Ent. France, (6) I, p. 69 (☿), Pl. iii, figs. 10, 11; 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 328 and 329 (☿, ♂), Pl. xxi, figs. 9–12, and 14–15. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 71. Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 422 (☿, ♀, ♂); 1907, Ann. Mus. Nat. Hungarici, V, p. 17 (♂); 1913, Ann. Soc. Ent. Belgique, LVII, pp. 138 and 351 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 200 (☿, ♀, ♂), Pl. v, figs. 57, 57a. See pp. 150 and 1021.

Type locality: St. Thomas, West Indies.

Tropicopolitan. Madeira: (E. Schmitz). Belgian Congo: Congo da Lemba (R. Mayné); Thysville (J. Bequaert). Rhodesia: Bulawayo (G. Arnold). German East Africa: Arusha-chini (Katona). Natal: Durban (C. B. Cooper).

1a. Subsp. **mahdii** Karawaiew, 1911, Rev. Russe Ent., XI, p. 8 (☿).

Type locality: Khartum, Anglo-Egyptian Sudan (Karawaiew).

Crematogastrini Emery

Crematogaster LUND[1]

Crematogaster LUND, 1831, Ann. Sc. Nat., XXIII, p. 132. MAYR, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 468.

Acrocœlia MAYR, 1852, Verh. Zool. Bot. Ges. Wien, II, p. 147.

Formica (part) FABRICIUS, OLIVIER. *Atta* (part) BUCKLEY. *Cremastogaster* MAYR, FOREL, SANTSCHI, etc. *Monomorium* (part) BUCKLEY.

Genotype: *Formica scutellaris* Olivier, 1791.

Subgenus 1. **Crematogaster** LUND, *sensu stricto*

Subgenotype: same as genotype.

1. **Crematogaster ægyptiaca** (MAYR). See p. 1022.

Cremastogaster ægyptiaca MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 765 (☿); 1863, ibid., XIII, p. 404. ROGER, 1863, 'Verzeich. Formicid.,' p. 36. EMERY, 1881, Ann. Mus. Civ. Genova, XVI, p. 535. ERN. ANDRÉ, 1883, 'Spec. Hym. Europ. Algérie,' II, p. 392 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 79. EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 10.

Type locality: EGYPT.

SOUTHERN ARABIA: Aden. ERITREA: Assab (Doria and Beccari).

1a. Subsp. **senegalensis** (ROGER) SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 344. See p. 1022.

Cremastogaster senegalensis ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 206 (☿, ♀); 1863, 'Verzeich. Formicid.,' p. 36. EMERY, 1877, Ann. Mus. Civ. Genova, IX, p. 379 (☿). MAGRETTI, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245; 1884, Ann. Mus. Civ. Genova, XXI, p. 343 (☿, ♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 86. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144; in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 7.

Type locality: Senegal (Sichel).

GOLD COAST. ANGLO-EGYPTIAN SUDAN: Suakin; Metemma; Sebderat; Ain (Magretti); Ondurman (I. Trägårdh). ERITREA: Bogos; Keren (Beccari).

1a₁. Var. **devincta** (SANTSCHI).

Cremastogaster ægyptiaca subsp. *senegalensis* var. *devincta* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 343 (☿).

Type locality: Konakry, FRENCH CONGO (F. Silvestri).

1a₂. Var. **robusta** EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 10 (☿, ♀, ♂).

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[1] *Crematogaster nitidus* "Smith," recorded from Angola (Welwitsch) by Radoszkowsky, 1881, Jorn. Sci. Ac., Lisboa, VIII, No. 31, p. 197, has apparently never been described.

Cremastogaster anceps? *anceptula*? Forel, 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 252 (♀), was originally described as the ♀ of *C. wellmani* Forel. It has not been included in the Catalogue, since it is probably the ♀ of another form.

Crematogaster scutellaris (Olivier) subspecies *schmidti* (Mayr) (*Acrocœlia schmidti* Mayr, 1852, Verh. Zool. Bot. Ges. Wien, II, p. 149, ☿, ♀; type locality: Wipbach, Carniola) is, according to Emery (1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 10), introduced in some of the harbors of the Red Sea: Port Sudan (*Cremastogaster ægyptiaca* Karawaiew, 1911, Rev. Russe Ent., XI, p. 8, ☿); Massaua (*C. castanea* Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 379, ☿; 1881, ibid., XVI, p. 535).

Sjöstedt (1908, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 116) mentions *Cremastogaster admota* "Mayr *in litt.*" as occurring in swollen thorns of *Acacia drepanolobium*, near Kahe, Usambara. I have not found the description of a form bearing that name.

Cremastogaster robusta Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 379 (♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 85.

Cremastogaster ægyptiaca Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 257 (☿, ♂) (*nec* Mayr).

Type locality: Keren, Eritrea (Beccari).

Eritrea: Nefasit (K. Escherich; F. Silvestri).

2. **Crematogaster alulai** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 11.

Crematogaster menileki var. *alulai* Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 61 (☿).

Cremastogaster menileki var. *alulai* Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿).

Cremastogaster meneliki var. *alulai* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 93 (☿).

Type locality: Ghinda, Eritrea (Belli).

British East Africa: Shimoni (Alluaud and Jeannel).

2*a*. Subsp. **scrutans** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 11 (☿).

Cremastogaster scrutans Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 258 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 518 (☿).

Type locality: Nefasit, Eritrea (K. Escherich; F. Silvestri).

3. **Crematogaster amabilis** (Santschi).

Cremastogaster amabilis Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 355 (☿); 1912, Bull. Soc. Ent. France, p. 412 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 91 (☿, ♀, ♂).

Type locality: Kilema, Mt. Kilimanjaro, 1440 m., German East Africa (Alluaud).

British East Africa: Crater of Longonot, Rift Valley, 2450 m.; Kijabe, Kikuyu Escarpment, 2100 m.; Molo, Mau Escarpment, 2420 m. (Alluaud and Jeannel). German East Africa: Mt. Kilimanjaro, near the Bismarckhügel, 2700–2800 m. (Alluaud and Jeannel).

4. **Crematogaster brunneipennis** (Ern. André).

Cremastogaster brunneipennis Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 323 (☿, ♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144.

Cremastogaster brunnæipennis Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 80.

Type locality: Sierra Leone (Mocquerys).

4*a*. Subsp. **acaciæ** (Forel).

Crematogaster acaciæ Forel, 1892, Zool. Anzeiger, XV, p. 141 (☿). Keller, *ibid.*, p. 139. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 152.

Cremastogaster acaciæ Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 353 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 79.

Type locality: Faf Plain, Webi River, Abyssinia (C. Keller).

4*a*₁. Var. **generosa** (Santschi).

Crematogaster acaciæ var. *generosa* Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 343 (☿, ♀).

Type locality: Durban, Natal (G. Arnold).

$4a_2$. Var. **gloriosa** (Santschi).

Cremastogaster acacia var. *gloriosa* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 346 (☿).

Type locality: Boma, Belgian Congo (F. Silvestri).

$4a_3$. Var. **victoriosa** (Santschi). See p. 152.

Crematogaster acacia subsp. *victoriosa* Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 497 (☿).

Cremastogaster acaciæ subsp. *victoriosa* Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 15. Arnold, 1920, Ann. South African Mus., XIV, pp. 488 and 500, fig. 35 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

Belgian Congo: Zambi (J. Bequaert). Natal: Durban (G. Arnold).

4*b*. Subsp. **omniparens** (Forel), *teste* Santschi *in litt.*

Cremastogaster brunneipennis subsp. *omniparens* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 237 (☿).

Cremastogaster bruneipennis subsp. *omniparens* Arnold, 1920, Ann. South African Mus., XIV, pp. 488 and 499, fig. 34 (☿).

Type locality: Durban, Natal (C. B. Cooper, G. Arnold).

5. **Crematogaster capensis** (Mayr).

Cremastogaster capensis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 764 (☿, ♀); 1863, ibid., XIII, p. 404. Roger, 1863, 'Verzeich. Formicid.,' p. 37. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 103 (☿, ♀), Pl. iv, fig. 30. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 80. Arnold, 1920, Ann. South African Mus., XIV, p. 512 (☿, ♀).

Type locality: Cape of Good Hope (Novara Expedition).

5_1. Var. **calens** (Forel).

Cremastogaster capensis var. *calens* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 435 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 513 (☿).

Type locality: Delagoa, Portuguese East Africa (Liengme).

5*a*. Subsp. **tropicorum** (Forel).

Cremastogaster capensis subsp. *tropicorum* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 435 (☿).

Type locality: Ibo, Portuguese East Africa.

6. **Crematogaster castanea** F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 136 (☿, ♀), Pl. ix, fig. 2. See p. 1022.

Crematogaster tricolor Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 ☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 515 (☿), Pl. xxxii, fig. 10.

Crematogaster arboreus F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 138 (☿), Pl. xiv (nest) (*nec* Mayr, *teste* Arnold).

Cremastogaster castanea Roger, 1863, 'Verzeich. Formicid.,' p. 37. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 404. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 80. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 99. Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., p. liii. Arnold, 1920, Ann. South African Mus., XIV, p. 488 (☿, ♀).

Cremastogaster arborea Roger, 1863, 'Verzeich. Formicid.,' p. 37. Arnold, 1920, Ann. South African Mus., XIV, p. 506 (☿).

Cremastogaster tricolor Roger, 1863, 'Verzeich. Formicid.,' p. 37. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 405; 1886, ibid., XXXVI, p. 365. Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 388 (♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 87. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 99. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 139. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 40. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 16. Sjöstedt, 1908, ibid., II, 8, pp. 99, 100, 117. Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿). Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 21 (☿, ♀). Trägårdh, ibid., p. 44. Reichensperger, 1915, ibid., V, pp. 8 and 20.

Cremastogaster tricolor var. *castanea* Forel, in Voeltzkow, 1907, "Reise in Ostafrika,' II, p. 80; 1911, Rev. Zool. Afr., III, p. 279 (☿). Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (☿).

Cremastogaster castanea subsp. *tricolor* Arnold, 1920, Ann. South African Mus., XIV, p. 489 (☿, ♀, ♂), Pl. vi, figs. 72 and 72a.

Type locality: Port Natal, Natal. Originally given by error as "Albania," but this was corrected by Roger in 1863.

Belgian Congo: Kondué (Luja). Orange Free State. Transvaal: Valdezia (P. Berthoud). Natal: Durban; Stamford Hill (I. Trägårdh). Cape Province: Cape of Good Hope; Port Alfred (C. B. Cooper; Hewitt); Grahamstown (G. Arnold). Portuguese East Africa: Delagoa Bay (Liengme); Tete (Peters). Zululand: Dukudu (I. Trägårdh). German East Africa: Lindi (Lamborn); Tanga (H. Brauns); Mt. Kilimanjaro (Sjöstedt). British East Africa: Lamu Island; Fundu Island; W. Pemba (Voeltzkow).

6_1. Var. **simia** (Forel).

Cremastogaster tricolor var. *simia* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 6 (☿, ♀, ♂). Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (☿).

Cremastogaster castanea subsp. *tricolor* var. *simia* Arnold, 1920, Ann. South African Mus., XIV, p. 491 (☿, ♀, ♂).

Type locality: Chakamakue, between Lehututu and Letlake, Bechuanaland (L. Schultze).

German Southwest Africa: (Peters). Natal: Stamford Hill (I. Trägårdh).

6a. Subsp. **ferruginea** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 12.

Cremastogaster ferruginea Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 353 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 81. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 258 (☿).

Crematogaster ferruginea Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 178 (☿); 1897, ibid., XXXVIII, p. 598.

Cremastogaster tricolor subsp. *ferruginea* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿).

Cremastogaster castanea subsp. *ferruginea* Arnold, 1920, Ann. South African Mus., XIV, p. 495 (☿).

Type locality: Somaliland (C. Keller).

Abyssinia: Lower Ganale (V. Bottego); Webi, Ganale; Ogaden: Daua (Ruspoli). Eritrea: Ghinda; Nefasit (K. Escherich).

$6a_1$. Var. **aquila** (Forel).

Cremastogaster ferruginea var *aquila* Forel, 1907, Rev d'Ent Caen, XXVI, p. 139 (☿).

Cremastogaster tricolor subsp. *ferruginea* var. *aquila* SANTSCHI, 1912, Bull. Soc. Ent. France, p. 413 (☿), 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 87 (☿, ♂).

Type locality: South of Lake Rudolf, BRITISH EAST AFRICA (de Rothschild).

BRITISH EAST AFRICA: Naivasha, Rift Valley, 1900 m.; Gilgil, 1980 m.; Nairobi, Voi, Taita, 600 m. (Alluaud and Jeannel).

6a_2. Var. **bruta** (SANTSCHI).

Cremastogaster tricolor subsp. *ferruginea* var. *bruta* SANTSCHI, 1912, Bull. Soc. Ent. France, p. 413 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 22 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 87 (☿).

Cremastogaster castanea subsp. *rufonigra* var. *bruta* ARNOLD, 1920, Ann. South African Mus., XIV, p. 495 (☿).

Type locality: NATAL.

NATAL: Stamford Hill (I. Trägårdh). BRITISH EAST AFRICA: Naivasha, Rift Valley, 1400 m. (Alluaud and Jeannel). SOUTHERN RHODESIA: Springvale (G. Arnold).

6a_3. Var. **durbanensis** (FOREL).

Cremastogaster ferruginea var. *durbanensis* FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 234 (☿).

Cremastogaster castanea subsp. *tricolor* var. *durbanensis* ARNOLD, 1920, Ann. South African Mus., XIV, p. 491, fig. 32 (☿, ♀).

Type locality: Durban, NATAL (G. Arnold).

6a_4. Var. **hararica** (FOREL).

Cremastogaster ferruginea var. *hararica* FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 97 (☿).

Cremastogaster tricolor subsp. *ferruginea* var. *harrarica* SANTSCHI, 1912, Bull. Soc. Ent. France, p. 413 (☿).

Crematogaster castanea subsp. *ferruginea* var. *harrarica* EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Type locality: Harar, southern ABYSSINIA (Ilg).

ERITREA: Nefasit (F. Silvestri).

6a_5. Var. **ulugurensis** (FOREL).

Cremastogaster ferruginea var. *ulugurensis* FOREL, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 369 (☿).

Cremastogaster tricolor subsp. *ferruginea* var. *ulugurensis* SANTSCHI, 1912, Bull. Soc. Ent. France, p. 413 (☿) (*uluguensis*); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 86 (☿, ♀, ♂).

Cremastogaster ferruginea var. *hararica* MAYR, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 15, Pl. II (nest).

Type locality: Uluguru Mts., GERMAN EAST AFRICA (Zimmer).

GERMAN EAST AFRICA: Morogoro (Zimmer); Kibonoto, Mt. Kilimanjaro (Sjöstedt). BRITISH EAST AFRICA: Nairobi, Kikuyu, 1700 m.; Blue Post Hotel, Tchania River, 1520 m. (Alluaud and Jeannel).

6a_6. Var. **yambatensis** (FOREL).

Cremastogaster ferruginea var. *yambatensis* FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (☿).

Type locality: Yambata, BELGIAN CONGO (R. Mayné).

6b. Subsp. **insidiosa** (Santschi).

Cremastogaster castanea subsp. *insidiosa* Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 378 (☿).

Type locality: Balli Neck Pass, German Southwest Africa (G. Arnold).

6c. Subsp. **inversa** (Forel).

Cremastogaster tricolor var. *inversa* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (☿); 1911, Rev. Zool. Afr., I, p. 279 (☿).

Crematogaster tricolor var. *inversa* Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 2 (☿, ♀, ♂).

Crematogaster tricolor subsp. *inversa* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 86 (☿).

Type locality: Patta Island, British East Africa (Voeltzkow).

Belgian Congo: Kondué (Luja). Southern Rhodesia: Ciuma (Elena d'Aosta). German East Africa: between Lake Kivu and Victoria Nyanza (Elena d'Aosta). Zanzibar: (Deville). British East Africa: Kisumu, Kavirondo Bay (C. Alluaud); Manda Island (Voeltzkow).

$6c_1$. Var. **analis** (Santschi). See p. 152.

Cremastogaster flaviventris var. *analis* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 372 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433 (☿, ♀, ♂).

Cremastogaster tricolor subsp. *inversa* var. *analis* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: Bafwasende to Avakubi (Lang and Chapin); Thysville (J. Bequaert).

$6c_2$. Var. **flaviventris** (Santschi). See p. 152.

Cremastogaster flaviventris Santschi, 1910, Ann. Soc. Ent. France. LXXVIII, (1909), p. 370 (☿, ♀, ♂).

Cremastogaster tricolor subsp. *inversa* var. *flaviventris* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 86 (♀).

Type locality: Sankuru, Belgian Congo (Luja).

Central Uganda: (C. Alluaud). Belgian Congo: Garamba (Lang and Chapin).

6d. Subsp. **museisapientiæ** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 272 (☿, ♀, ♂).

Cremastogaster tricolor subsp. *museisapientia* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿).

Type locality: Tropical Africa; exact locality unknown.

6e. Subsp. **rufimembrum** (Santschi).

Cremastogaster tricolor subsp. *rufimembrum* Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 431 (☿).

Type locality: Khutu Steppe, German East Africa (K. Schwartze).

6f. Subsp. **rufonigra** (Emery).

Crematogaster tricolor subsp. *rufonigra* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 27 (☿).

Cremastogaster tricolor var. *rufonigra* Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 22 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 6 (☿).

Cremastogaster tricolor subsp. *rufoniger* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 124 and 352 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 342 (☿).

Cremastogaster castanea subsp. *rufonigra* Arnold, 1920, Ann. South African Mus., XIV, p. 492 (☿, ♀, ♂).

Type locality: Hebron, Transvaal (E. Simon).

Transvaal: Hamman's Kraal (E. Simon); Pretoria (F. Silvestri). Southern Rhodesia: common (G. Arnold). German East Africa: Kibosho (H. Brauns). Belgian Congo: Elisabethville (Leplae). German Southwest Africa: (Lübbert). Kalahari: Kakir (L. Schultze).

$6f_1$. Var. **busschodtsi** (Emery).

Crematogaster tricolor var. *busschodtsi* Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 487 (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 80. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 80.

Crematogaster tricolor subsp. *rufoniger* var. *busscholdsi* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿).

Type locality: Banana, Belgian Congo (Busschodts).

British East Africa: Fundu Island, W. Pemba (Voeltzkow).

$6f_2$. Var. **cacodæmon** (Forel).

Cremastogaster peringueyi subsp. *cacodæmon* (part) Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 234 (☿, ♀, ♂).

Cremastogaster castanea subsp. *rufonigra* var. *cacodæmon* Arnold, 1920, Ann. South African Mus., XIV, p. 494 (☿, ♀, ♂).

Type locality: Willowmore, Cape Province (G. Arnold).

$6f_3$. Var. **mediorufa** (Forel).

Cremastogaster tricolor var. *mediorufa* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81, footnote (☿, ♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 372 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 124 (☿, ♀, ♂).

Cremastogaster tricolor subsp. *rufonigra* var. *mediorufa* Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 86 (☿).

Cremastogaster castanea subsp. *rufonigra* var. *medio-rufa* Arnold, 1920, Ann. South African Mus., XIV, p. 493 (☿, ♀, ♂), Pl. vi, figs. 77, 77a, and 77b.

Type locality: Shilouvane, Transvaal (Junod).

Belgian Congo: Bamu Island (A. Weiss). British East Africa: Tiwi (Alluaud and Jeannel). Cape Province: Aberdeen (H. Brauns).

$6f_4$. Var. **quisquilia** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 502 (☿).

Cremastogaster castanea subsp. *rufonigra* var. *quisquilia* Arnold, 1920, Ann. South African Mus., XIV, p. 495 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

7. **Crematogaster censor** (Forel).

Cremastogaster senegalensis subsp. *censor* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 434 (☿).

Type locality: Senegal (Æberli).

7a. Subsp. **junodi** (Forel).

Cremastogaster censor subsp. *junodi* Forel, 1916, Rev. Suisse Zool., XXIV, p. 406 (☿).

Type locality: Shilouvane, Transvaal (Junod).

8. **Crematogaster chiarinii** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 117; 1897, ibid., XXXVIII, p. 598; 1899, ibid., XXXIX, p. 500; 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 61. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 152 and 168.

Cremastogaster chiarinii Emery, 1881, Ann. Mus. Civ. Genova, XVI, pp. 271, fig. (☿) and 535. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 80. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 120. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 99. Wasmann, 1896, Notes Leyden Mus., XVIII, p. 76. F. Kohl, 1907, Denkschr. Ak. Wiss. Wien, LXXI, p. 282 (☿, ♀). Mayr, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 388; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 16 (☿, ♀, ♂). Sjöstedt, 1908, ibid., II, 8, pp. 99 and 115. Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 201. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 85 (☿). Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, p. 35.

Type locality: Kaka, Schoa, Abyssinia (Antinori).

Southern Arabia: Tes (Doria and Beccari); Ras Fartak (O. Simony); Gischin (W. Hein). Eritrea: Saati (Belli). Somaliland: Obbia (Bricchetti-Robecchi). Abyssinia: Dimé to Bass Narok (V. Bottego); southern Abyssinia (A. Ilg); Ogaden (Ruspoli). Anglo-Egyptian Sudan: Khor Attar; Taufikia near Fashoda (F. Werner). British East Africa: Lusinga Island, Victoria Nyanza (C. Alluaud). German East Africa: Kibonoto, Mt. Kilimandjaro; Ngare na Nyuki R., Mt. Meru (Sjöstedt).

8_1. Var. **æthiops** (Forel).

Cremastogaster chiarinii var. *æthiops* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 142, footnote (☿).

Type locality: Somaliland (Keller).

8_2. Var. **affabilis** (Forel).

Cremastogaster chiarinii var. *affabilis* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 142 (☿).

Type locality: Daouele Region, Somaliland (de Rothschild).

Abyssinia: Harar (Ilg).

8_3. Var. **cincta** Emery, 1896, Ann. Mus. Civ. Genova, XXXVII, p. 157 (☿); 1897, ibid., XXXVIII, p. 598 (☿); 1899, ibid., XXXIX, p. 500.

Cremastogaster chiarinii Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 353 (☿, ♀, ♂) (*nec* Emery). Wasmann, ibid., p. 355.

Crematogaster chiarinii Forel, 1892, Zool. Anzeiger, XV, p. 140 (☿, ♀, ♂). Keller, ibid., p. 139. (*nec* Emery).

Cremastogaster chiarinii var. *cincta* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 142, footnote.

Type locality: Lugh, Somaliland (V. Bottego).

Abyssinia: near the Webi River (C. Keller); Canale; Ogaden; Hauacio; Leboi (Ruspoli).

8_4. Var. **v-nigrum** (Forel).

Cremastogaster chiarinii var. *v-nigrum* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 434 (☿).

Type locality: Congo.

8a. Subsp. **sellula** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 431 (☿).

Type locality: Khutu Steppe, German East Africa (K. Schwartze).

8*b*. Subsp. **subsulcata** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 432 (☿).

Cremastogaster chiarini Karawaiew, 1911, Rev. Russe Ent., XI, p. 7 (☿).

Type locality: Khartum, Anglo-Egyptian Sudan (Karawaiew).

8*c*. Subsp. **tædiosa** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 12.

Cremastogaster tædiosa Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 98 (☿).

Type locality: Southern Abyssinia (Ilg).

Eritrea: Gomod, Saati (Belli); Algota (A. Fiori).

9. **Crematogaster cicatriculosa** (Roger).

Cremastogaster cicatriculosa Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 207 (☿); 1863, 'Verzeich. Formicid.,' p. 37. Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 901 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 80.

Type locality: South Africa.

Sierra Leone.

10. **Crematogaster constructor** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 29 (☿), Pl. II, figs. 12, 13.

Cremastogaster constructor Emery, in Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 135, footnote, fig. 3 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 535, fig. 49 (☿).

Type locality: Hamman's Kraal, Transvaal (E. Simon).

10_1. Var. **kirbyi** (Mayr).

Cremastogaster constructor var. *kirbyi* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, pp. 135 and 137 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 535 (☿).

Type locality: South Africa.

11. **Crematogaster excisa** (Mayr) H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 109 and 167. See p. 153.

Cremastogaster excisa Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 139 (☿). Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 501 (☿).

Type locality: Loango, French Congo (H. Brauns).

Sierra Leone. Belgian Congo: Zambi; Thysville (J. Bequaert); Faradje; near Lie (Lang and Chapin).

11a. Subsp. **andrei** (Forel). See p. 153.

Cremastogaster excisa subsp. *andrei* Forel, 1911, Rev. Zool. Afr., I, p. 277 (☿; according to Arnold *in litt.*, with 11-jointed antennæ).

Cremastogaster impressa subsp. *andrei* Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

Belgian Congo: Oso River; Sitaweza between Walikale and Lubutu (J. Bequaert).

11*b*. Subsp. **cavinota** (Stitz).

Cremastogaster excisa subsp. *cavinota* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 385, fig. 5 (☿).

Type locality: between Fort de Possel and Fort Crampel, French Congo (Schubotz).

11*c*. Subsp. **cœlestis** (Santschi).

Cremastogaster cœlestis Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 353 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 324 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 346 (☿).

Cremastogaster excisa subsp. *cœlestis* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 342.

Type locality: Casamance (Claveau).

Belgian Congo: Kondué (Luja). French Guinea: Camayenne (F. Silvestri).

11c_1. Var. **dirce** (Forel).

Cremastogaster excisa subsp. *cœlestis* var. *dirce* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 342 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

11*d*. Subsp. **impressa** (Emery) Santschi *in litt.*

Crematogaster impressa Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 486 (☿, ♀). H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 103 and 167.

Cremastogaster impressa Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 59 and 69 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 373 (☿). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 270 (☿). Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (☿); 1916, Rev. Suisse Zool., XXIV, p. 408 (☿, ♀, ♂).

Type locality: Cameroon (Conradt).

Ivory Coast: Bassam (Bonhouse). Belgian Congo: Lower Congo (Solon); Kilongalonga (Kohl); Stanleyville (Kohl); Isangi (Laurent); Congo da Lemba (R. Mayné). French Congo: Brazzaville (A. Weiss). Cape Province: Algoa Bay (H. Brauns).

11d_1. Var. **aglæa** Santschi. See p. 153 (☿).

Type locality: Dimbroko, Ivory Coast (Le Moult).

11d_2. Var. **euphrosyne** Santschi. See p. 153 (☿).

Type locality: Faradje, Belgian Congo (Lang and Chapin).

Belgian Congo: Thysville (Lang and Chapin).

11d_3. Var. **sapora** (Forel). See p. 154.

Cremastogaster impressa var. *sapora* Forel, 1916, Rev. Suisse Zool., XXIV, p. 408 (☿, ♀).

Type locality: Belgian Congo (Kohl).

Belgian Congo: Yakuluku (Lang and Chapin).

11*e*. Subsp. **lacustris** (Santschi).

Cremastogaster excisa subsp. *lacustris* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 99 (☿).

Type locality: Lusinga Island, Victoria Nyanza, British East Africa (C. Alluaud).

11*f*. Subsp. **maynei** (Forel).

Cremastogaster impressa subsp. *maynei* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 352 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

12. **Crematogaster foraminiceps** (Santschi).

Cremastogaster foraminiceps Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 89 (☿, ♀, ♂). Raffray, 1913, ibid., Pselaphidæ, p. 55, fig. (nest; without description).

Type locality: Nairobi, Kikuyu, 1700 m., British East Africa (Alluaud and Jeannel).

British East Africa: River Burgurett, Mt. Kenia, 2200 m.; Mt. Kenia, 2400 m.; River Amboni, 1800 m.; Voi (Alluaud and Jeannel).

12*a*. Subsp. **nigrans** (Forel).

Cremastogaster foraminiceps subsp. *nigrans* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 338 (☿, ♀).

Type locality: St. Gabriel, Belgian Congo (Kohl).

12*b*. Subsp. **staitchi** (Forel).

Cremastogaster foraminiceps subsp. *staitchi* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 339 (☿, ♀).

Type locality: Lumaliza, Belgian Congo (Kohl).

13. **Crematogaster gallicola** (Forel).

Cremastogaster gallicola Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 95 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 531, fig. 47 (☿, ♀).

Type locality: Delagoa (Liengme).

Southern Rhodesia: Somabula (G. Arnold).

13_1. Var. **rauana** (Forel).

Cremastogaster gallicola var. *rauana* Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 22 (☿).

Type locality: Moschi near the Rau River, Arushi-chini, German East Africa (Katona).

13*a*. Subsp. **latro** (Forel).

Cremastogaster gallicola subsp. *latro* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 6 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 533 (☿).

Type locality: between Kgokong and Kang, Bechuanaland (L. Schultze).

13*b*. Subsp. **spuria** (Forel).

Cremastogaster gallicola subsp. *spuria* Forel, 1913, Rev. Zool. Afr., II, p. 323 (☿). Bequaert, ibid., p. 425.

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

14. **Crematogaster gerstæckeri** (Dalla Torre).

Cremastogaster cephalotes Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 356 (☿, ♀) (*nec* F. Smith); 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 358 (☿, ♀).

Crematogaster cephalotes Keller, 1892, Zool. Anzeiger, XV, p. 137. H. Kohl, 1909, Natur u. Offenbarung, LV, p. 152.

Cremastogaster gerstæckeri Dalla Torre, 1892, Wien. Ent. Zeitg., XI, March, p. 90; 1893, 'Cat. Hym.,' VII, p. 82.

Crematogaster gerstäckeri Forel, 1892, Zool. Anzeiger, XV, April, p. 141. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 214 (☿, ♀).

Cremastogaster gerstackeri Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 137 (☿). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 40.

Type locality: Mombasa, British East Africa (v. d. Decken).

Uganda: Butiti (Duke of Abruzzi).

15. **Crematogaster godefreyi** (Forel).

Cremastogaster foraminiceps subsp. *godefreyi* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 237 (☿).

Cremastogaster vulcania subsp. *godefreyi* Forel, 1916, Rev. Suisse Zool., XXIV, p. 406.

Crematogaster neuvillei subsp. *carininotum* Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), pp. 279 and 280 (☿).

Cremastogaster sjæstedti subsp. *godefreyi* Santschi, 1918, Bull. Soc. Ent. France, p. 184.

Cremastogaster godfreyi Arnold, 1920, Ann. South African Mus., XIV, p. 503, fig. 37 (☿).

Cremastogaster neuvillei subsp. *carininotum* Arnold, 1920, Ann. South African Mus., XIV, p. 499 (☿).

Type locality: King William's Town, Cape Province (R. Godfrey).

Rhodesia: Bulawayo (G. Arnold).

15_1. Var. **arnoldi** (Forel).

Cremastogaster arnoldi Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 238 (☿).

Cremastogaster godfreyi var. *arnoldi* Arnold, 1920, Ann. South African Mus., XIV, p. 504, fig. 38 (☿).

Type locality: Durban, Natal (Marley).

16. **Crematogaster gutenbergi** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 433 (☿).

Type locality: German Southwest Africa.

17. **Crematogaster ilgi** (Forel) Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 502.

Cremastogaster scrutans var. *ilgii* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 259 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 519 (♀).

Type locality: Western Abyssinia (Ilg).

Transvaal: Zoutpansberg.

18. **Crematogaster impressiceps** (Mayr). See p. 154.

Cremastogaster impressiceps Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 294 (☿).

Type locality: Fernando Po (R. Buchholz).

Cameroon: Abo (R. Buchholz). Belgian Congo: Panga; Faradje (Lang and Chapin).

18_1. Var. **frontalis** Santschi. See p. 154 (☿).

Type locality: Malela, Belgian Congo (Lang and Chapin).

Belgian Congo: Kunga near Malela (Lang, Chapin and J. Bequaert).

18_2. Var. **longiscapa** (Stitz).

Cremastogaster impressiceps var. *longiscapa* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 384 (☿), Pl. xx (nest).

Type locality: Duma, Belgian Congo (Schubotz).

18a. Var. **lujana** (Forel).

Cremastogaster impressiceps var. *lujana* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 340 (☿).

Type locality: Kondué, Belgian Congo (Luja).

19. **Crematogaster inconspicua** (Mayr).

Cremastogaster inconspicua Mayr, 1896, Ent. Tidskr., XVII, p. 246 (☿, ♀). Aurivillius, ibid., p. 253, Pl. iv, fig. 1 (nest). Sjöstedt, 1904, I Västafrikas Urskogar, p. 504, fig. 1 (nest).

Type locality: Cameroon (Sjöstedt).

19a. Subsp. **incorrecta** Santschi, 1917, Ann. Soc. Ent. France, LXXXV (1916), p. 280 (☿).

Type locality: Gaboon, French Congo (F. Faure).

20. **Crematogaster inermis** (Mayr).

Cremastogaster inermis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 766 (☿); 1895, Ann. Naturh. Hofmus. Wien, X, p. 137 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 8 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 487 (☿).

Type locality: Sinai Peninsula (v. Frauenfeld).

Anglo-Egyptian Sudan: Port Sudan (Karawaiew).

20a. Subsp. **delagoensis** (Forel).

Cremastogaster inermis subsp. *delagoensis* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 99 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 539, fig. 51 (☿).

Type locality: Delagoa (Liengme).

21. **Crematogaster melanogaster** (Emery).

Cremastogaster arborea Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 900 (☿, ♀), Pl. xx, fig. 10; 1886, ibid., XXXVI, p. 360; 1896, Ent. Tidskr., XVII, p. 248, footnote (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 507 (☿). (*nec C. arborea* F. Smith, *teste* Mayr and Arnold).

Crematogaster arborea subsp. *melanogaster* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 29 (☿, ♀).

Cremastogaster arborea subsp. *melanogaster* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 7 (☿, ♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 234 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 508, fig. 39 (☿, ♀).

Type locality: Port Natal, Natal (Gueinzius).

Cape Province: De Aar (E. Simon); Conway (Hewitt); Willowmore (H. Brauns); Little Namaland (L. Péringuey); Kamaggas (L. Schultze).

22. **Crematogaster menileki** (Forel) Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500.

Cremastogaster menilekii Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 97 (☿).

Cremastogaster menileki Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿).

Type locality: Schoa, southern Abyssinia (Ilg).

Abyssinia: Buditu to Dimé (V. Bottego).

22a. Subsp. **occidentalis** (Mayr).

Cremastogaster menileki subsp. *occidentalis* Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 293 (☿). Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿).

Crematogaster meneliki subsp. *occidentalis* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 252 (☿).

Type locality: Fernando Po (R. Buchholz).

Gold Coast. Dahomey: Kouande (Desanti).

22a_1. Var. **atrigaster** (Forel).

Cremastogaster meneliki subsp. *occidentalis* var. *atrigaster* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

22a_2. Var. **brazzai** (Santschi).

Cremastogaster impressa subsp. *brazzai* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 373 (☿, ♀).

Cremastogaster menileki subsp. *occidentalis* var. *brazzai* Santschi, 1912, Bull. Soc. Ent. France, p. 412 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

22*b*. Subsp. **proserpina** Santschi. See p. 154 (☿).

Type locality: Malela, Belgian Congo (Lang and Chapin).

22b_1. Var. **pluton** (Santschi).

Crematogaster meneliki subsp. *proserpina* var. *pluton* Santschi, 1919, Rev. Zool. Afr., VII, p. 87 (☿).

Type locality: Zambi, Belgian Congo (J. Bequaert).

22*c*. Subsp. **satan** (Forel).

Cremastogaster menileki subsp. *satan* Forel, 1916, Rev. Suisse Zool., XXIV, p. 407 (☿).

Type locality: Belgian Congo (Kohl).

22c_1. Var. **satanula** (Forel).

Cremastogaster menileki subsp. *satan* var. *satanula* Forel, 1916, Rev. Suisse Zool., XXIV, p. 407 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

23. **Crematogaster mimosæ** (Santschi).

Cremastogaster mimosæ Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 87, fig. 11 (☿).

Type locality: Mt. Kenia, 2000 m., British East Africa (C. Alluaud).

24. **Crematogaster misella** (Arnold).

Cremastogaster gallicola subsp. *sjostedti* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 237 (☿) (*nec* Mayr).

Cremastogaster misella Arnold, 1920, Ann. South African Mus., XIV, p. 513, fig. 40a (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

25. **Crematogaster monticola** (Arnold).

Cremastogaster monticola Arnold, 1920, Ann. South African Mus., XIV, p. 517, fig. 40*b* (☿).

Type locality: Mountains of Natal (Haviland).

26. **Crematogaster neuvillei** (Forel) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 279 (☿).

Cremastogaster neuvillei Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 140 (☿). Santschi, 1912, Bull. Soc. Ent. France, p. 413 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 497 (☿).

Type locality: Comber, southern Abyssinia (de Rothschild).

26*a*. Subsp. **cooperi** (Forel) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 280 (☿).

Cremastogaster neuvillei subsp. *cooperi* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 233 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 488 and 497, fig. 33 (☿, ♀), Pl. vi, figs. 76 and 76a.

Type locality: Durban, Natal (C. B. Cooper).

26a₁. Var. **ingravis** (Forel) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 280 (☿).

Cremastogaster neuvillei subsp. *cooperi* var. *ingravis* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 341 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 498 (☿).

Type locality: Durban, Natal (C. B. Cooper).

27. **Crematogaster nigriceps** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 600, fig. (☿).

Type locality: Banas, Somaliland (Ruspoli).

Abyssinia: Hauacio (Ruspoli).

27a. Subsp. **prelli** (Forel).

Cremastogaster nigriceps subsp. *prelli* Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 368 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 98 (☿).

Type locality: Kahe Steppe, German East Africa (H. Prell).

Uganda: Unyoro Province, region of Lake Albert (C. Alluaud).

28. **Crematogaster nigronitens** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 281 (☿).

Cremastogaster nigronitens Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 541, fig. 53 (☿).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

29. **Crematogaster ochraceiventris** (Stitz).

Cremastogaster ochraceiventris Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 391, fig. 8 (☿).

Type locality: Fort Crampel, French Congo (Schubotz).

30. **Crematogaster opaciceps** (Mayr).

Cremastogaster opaciceps Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 12 (☿), Pl. i, fig. 1; Pl. ii, fig. 3 (nest). Arnold, 1920, Ann. South African Mus., XIV, p. 514 (☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

30₁. Var. **clepens** (Forel).

Cremastogaster opaciceps var. *clepens* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

30a. Subsp. **defleta** (Forel).

Cremastogaster opaciceps subsp. *defleta* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 434 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 515 (☿).

Type locality: Transvaal (C. Keller).

31. **Crematogaster orobia** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 343 (☿).

Type locality: Matroosberg, 4500 ft., Cape Province (R. W. Tucker).

32. **Crematogaster peringueyi** Emery, 1895, Ann. Soc. Ent. France, LXIII, p. 27 (☿, ♀, ♂), Pl. ii, figs. 16 and 17. Raffray, 1910, Ann. South African Mus., V, 8, pp. 422 and 423.

Cremastogaster peringueyi Wasmann, 1897, Wien. Ent. Zeitg., XVI, p. 201; 1898, ibid., XVII, p. 97; 1899, Deutsch. Ent. Zeitschr., p. 170. Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 14, Pl. II, fig. 4 (nest). Forel, in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 7 (☿, ♀, ♂); 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 509 (☿, ♀, ♂), Pl. VI, fig. 83.

Type locality: Cape Town, Cape Province (E. Simon; L. Péringuey).

Cape Province: Port Elizabeth (H. Brauns); Port Alfred (Hewitt); Port Nolloth; Steinkopf (L. Schultze); Pirie Forest (G. Rogers).

32_1. Var. **angustior** (Arnold).

Cremastogaster peringueyi subsp. *cacodæmon* (part) Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 234 (☿, ♀, ♂).

Cremastogaster peringueyi var. *angustior* Arnold, 1920, Ann. South African Mus., XIV, p. 510, fig. 40 (☿, ♀, ♂).

Type locality: Durban, Natal (C. B. Cooper).

32_2. Var. **cacochyma** (Forel).

Cremastogaster peringueyi subsp. *cacochyma* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 235 (☿, ♀).

Cremastogaster peringueyi var. *cacochyma* Arnold, 1920, Ann. South African Mus., XIV, p. 512 (☿, ♀).

Type locality: not given; probably Cape Province.

32_3. Var. **gedeon** (Forel).

Cremastogaster peringueyi subsp. *cacodæmon* var. *gedeon* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 341 (☿).

Cremastogaster peringueyi var. *gedeon* Arnold, 1920, Ann. South African Mus., XIV, p. 512 (☿).

Type locality: Pietermaritzburg, Natal (R. Bayer).

Natal: New Hanover Rail. (C. B. Hardenburg).

33. **Crematogaster rivai** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 598, fig. (☿).

Type locality: Webi, Abyssinia (Ruspoli).

Abyssinia: Ganale (Ruspoli).

34. **Crematogaster ruspolii** Forel, 1892, Zool. Anzeiger, XV, p. 142 (☿, ♂). Keller, ibid., p. 139. H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 152 and 168.

Cremastogaster ruspolii Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 353 (☿, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 85.

Type locality: Faf, Abyssinia (C. Keller).

Abyssinia: Webi River (C. Keller).

34_1. Var. **atriscapis** (Forel).

Cremastogaster ruspolii var. *atriscapis* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 338 (☿); 1916, Rev. Suisse Zool., XXIV, p. 405 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

35. **Crematogaster schultzei** (Forel).

Cremastogaster schultzei Forel, in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 6 (☿, ♀). Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 519, fig. 41 (☿, ♀).

Type locality: Steinkopf, Cape Province (L. Schultze).

Cape Province: Kamaggas; Prince of Wales Bay (L. Schultze).

36. **Crematogaster sewellii** (Forel). See p. 1023.

36a. Subsp. **acis** (Forel).

Cremastogaster sewellii subsp. *acis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

36*b*. Subsp. **marnoi** (Mayr). See p. 1024.

Cremastogaster sewellei var. *marnoi* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 138 (☿); 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 388.

Cremastogaster swelli subsp. *marnoi* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 376 (☿).

Type locality: Sudan (E. Marno).

French Congo: Gomba (A. Weiss). Anglo-Egyptian Sudan: Mongalla (F. Werner).

37. **Crematogaster sjöstedti** (Mayr).

Cremastogaster sjostedti Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 17 (☿). Sjöstedt, 1908, ibid., II, 8, p. 116. Santschi, 1918, Bull. Soc. Ent. France, p. 184.

Cremastogaster gallicola subsp. *sjöstedti* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 124. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 94 (☿).

Type locality: Usambara, near Tanda, German East Africa (Sjöstedt).

German East Africa: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel).

37_1. Var. **maledicta** (Forel).

Cremastogaster excisa var. *maledicta* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 236 (☿, ♀). Arnold, 1920, Ann. South African Mus., XIV, p. 502, fig. 36 (☿, ♀).

Cremastogaster sjœstedti var. *maledita* Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 15.

Type locality: Bulawayo, Rhodesia (G. Arnold).

37_2. Var. **pulla** (Santschi).

Cremastogaster gallicola subsp. *sjöstedti* var. *pulla* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 94 (☿).

Type locality: Mbuyuni, Pori, 1110 m., British East Africa (Alluaud and Jeannel).

British East Africa: Taveta, 750 m. (Alluaud and Jeannel).

37_3. Var. **rufescens** (Santschi).

Crematogaster sjœstedti subsp. *bulawayensis* var. *rufescens* Santschi, 1919, Rev. Zool. Afr., VI, p. 236 (☿).

Type locality: Natal (Haviland).

37a. Subsp. **kohliella** (Forel).

Cremastogaster excisa subsp. *andrei* var. *kohliella* Forel, 1916, Rev. Suisse Zool., XXIV, p. 409 (☿).

Cremastogaster sjöstedti subsp. *kohliella* Santschi, 1918, Bull. Soc. Ent. France, p. 185.

Type locality: St. Gabriel, Belgian Congo (Kohl).

38. **Crematogaster solers** (Forel).

Cremastogaster solers Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 7 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 516 (☿).

Type locality: Arasab River, near Kubub, GERMAN SOUTHWEST AFRICA (L. Schultze).

39. **Crematogaster stigmata** (SANTSCHI).

Cremastogaster stigmata SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 344, fig. 15 (☿, ♂).

Type locality: Olokemeji, NIGERIA (F. Silvestri).

40. **Crematogaster vulcania** (SANTSCHI).

Cremastogaster vulcania SANTSCHI, 1912, Bull. Soc. Ent. France, p. 413 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 94, fig. 13 (☿, ♀, ♂). LECERF, 1914, ibid., 'Chenilles Galles Formicides,' pp. 5, 11, 13, 17, 18, 23, and 25.

Type locality: Longonot Neck, 2140 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

41. **Crematogaster werneri** (MAYR).

Cremastogaster werneri MAYR, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 388 (☿).

Type locality: Gondokoro, UGANDA (F. Werner).

41_1. Var. **cacozela** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 253.

Cremastogaster cacozela SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar., VIII, p. 342 (☿).

Type locality: Camayenne, FRENCH GUINEA (F. Silvestri).

41_2. Var. **pasithea** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 253 (☿).

Type locality: LOWER DAHOMEY (Desanti).

Subgenus 2. **Sphærocrema** SANTSCHI

Cremastogaster subg. *Sphærocrema* SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Subgenotype: *Cremastogaster kneri* Mayr, 1862.

42. **Crematogaster (Sphærocrema) bequaerti** (FOREL).

Cremastogaster bequaerti FOREL, 1913, Rev. Zool. Afr., II, p. 319 (☿, ♀). BEQUAERT, ibid., p. 425. SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 93, fig. 12a (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 348, fig. 17a (☿).

Cremastogaster (Sphærocrema) bequaerti SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Sankisia, BELGIAN CONGO (J. Bequaert).

42_1. Var. **atraplex** SANTSCHI. See p. 155 (☿).

Type locality: Yakuluku, BELGIAN CONGO (Lang and Chapin).

42_2. Var. **gerardi** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 252 (☿).

Type locality: Kataki, BELGIAN CONGO (Gérard).

42_3. **Var. mutabilis** (SANTSCHI).

Cremastogaster bequaerti var. *mutabilis* SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 93, fig. 12b (☿).

Type locality: Lumbwa, Mau Escarpment, 1900 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

42a. Subsp. ludia (FOREL).

Cremastogaster bequaerti subsp. *ludia* FOREL, 1913, Rev. Zool. Afr., II, p. 321 (☿).

Type locality: Lake Kabwe, BELGIAN CONGO (J. Bequaert).

43. **Crematogaster (Sphærocrema) chlorotica** EMERY.

Crematogaster chlorotica EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 483 (☿, ♀).

Cremastogaster chlorotica SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 374 (☿). FOREL, 1913, Rev. Suisse Zool., XXI, p. 669 (☿).

Cremastogaster (Sphærocrema) chlorotica SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: CAMEROON (Conradt).

SIERRA LEONE. CAMEROON: Johann-Albrechtshöhe (Conradt). FRENCH CONGO: Brazzaville (A. Weiss).

44. **Crematogaster (Sphærocrema) concava** EMERY. See p. 155.

Crematogaster concava EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 480 (☿; *nec* ♀).

Cremastogaster concava SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 375 (☿, ♀, ♂). FOREL, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 338 (☿); 1916, Rev. Suisse Zool., XXIV, p. 404 (☿, ♀, ♂). STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 384 (☿).

Cremastogaster (Sphærocrema) concava SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Popokabaka, BELGIAN CONGO.

CAMEROON. FRENCH CONGO: Brazzaville (A. Weiss); Fort de Possel to Fort Crampel (Schubotz). BELGIAN CONGO: St. Gabriel (Kohl); Lukolela to Basoko; Stanleyville; Akenge (Lang and Chapin).

45. **Crematogaster (Sphærocrema) gambiensis** (ERN. ANDRÉ).

Cremastogaster gambiensis ERN. ANDRÉ, 1889, Rev. d'Ent. Caen, VIII, p. 228 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 82. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 137; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. FOREL, 1913, Rev. Zool. Afr., II, p. 324 (☿, ♀). SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 346 (☿). ARNOLD, 1920, Ann. South African Mus., XIV, p. 529 (☿).

Cremastogaster gambiensis var. *longiruga* FOREL, 1907, Rev. d'Ent. Caen, XXVI, p. 140 (☿, ♀, ♂).

Type locality: GAMBIA (Mocquerys).

FRENCH GUINEA: Konakry (F. Silvestri). SIERRA LEONE: Samlia Falls, River N'Gamie. GOLD COAST. SLAVE COAST. BELGIAN CONGO: Kwesi to Kilo (Bayer). ANGLO-EGYPTIAN SUDAN: Mongalla (F. Werner). UGANDA: Gondokoro (F. Werner). BRITISH EAST AFRICA: Rendilé, Mt. Karoli; Mt. Nyiro (de Rothschild).

45_1. Var. **krantziana** (FOREL).

Cremastogaster gambiensis var. *krantziana* FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 234 (☿, ♂). ARNOLD, 1920, Ann. South African Mus., XIV, pp. 487 and 530 (☿, ♀, ♂).

Type locality: Krantz Kloof near Durban, NATAL (Marley).

45_2. Var. **transversiruga** (SANTSCHI).

Cremastogaster gambiensis var. *transversiruga* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 346 (☿).

Type locality: Lado, Redjaf, ANGLO-EGYPTIAN SUDAN (Reichensperger).

46. **Crematogaster (Sphærocrema) kneri** (MAYR).

Cremastogaster kneri MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 764 (☿); 1863, ibid., XIII, p. 404. ROGER, 1863, 'Verzeich. Formicid.,' p. 36. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 82. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433 (☿, ♀, ♂); 1913, ibid., LVII, p. 125 (☿, ♀). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 525, fig. 45 (☿, ♀).

Crematogaster kneri Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 598 (☿); 1899, Ann. Soc. Ent. Belgique, XLIII, p. 483.

Cremastogaster (Sphærocrema) kneri Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Akwapim Mts., Gold Coast.

Abyssinia: Ganale (Ruspoli). Orange Free State: Bothaville (H. Brauns). Natal: (Haviland). Belgian Congo: (Seeldrayers).

46_1. Var. **amita** (Forel).

Cremastogaster kneri var. *amita* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 125 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 527 (☿), Pl. vi, fig. 75.

Type locality: Bulawayo, Rhodesia (G. Arnold).

46_2. Var. **matabele** (Arnold).

Cremastogaster kneri var. *matabele* Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 528, fig. 46 (☿).

Type locality: Hillside, Bulawayo, Rhodesia (G. Arnold).

46a. Subsp. **hottentota** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 482 (☿).

Crematogaster kneri Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 27 (☿) (*nec* Mayr).

Cremastogaster kneri subsp. *hottentota* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 125 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 528 (☿).

Type locality: Vrijburg, Cape Province (E. Simon).

Southern Rhodesia: Bedza, Matoppo Hills; Springvale; Sipapoma (G. Arnold). Orange Free State: Bloemfontein (E. Simon).

47. **Crematogaster (Sphærocrema) libengensis** (Stitz).

Cremastogaster libengensis Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 389, fig. 7 (☿).

Type locality: Libenge, Belgian Congo (Schubotz).

48. **Crematogaster (Sphærocrema) luctans** (Forel).

Cremastogaster luctans Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 22 (☿, ♀).

Crematogaster luctans Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 12.

Cremastogaster (Sphærocrema) luctans Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Mto-ya-Kifaru, German East Africa (Katona).

Eritrea: Nefasit (F. Silvestri).

49. **Crematogaster (Sphærocrema) nigeriensis** (Santschi).

Cremastogaster nigeriensis Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 346, fig. 16 (☿).

Cremastogaster (Sphærocrema) nigeriensis Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Lagos, Southern Nigeria (F. Silvestri).

49_1. Var. **wilniger** (Forel).

Cremastogaster nigeriensis var. *wilniger* Forel, 1916, Rev. Suisse Zool., XXIV, p. 405 (☿, ♀).

Type locality: St. Gabriel, Belgian Congo (Kohl).

50. **Crematogaster** (**Sphærocrema**) **pronotalis** Santschi.

Cremastogaster pronotalis Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 347, fig. 17*b* (☿).

Crematogaster pronotalis Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 252 (☿).

Cremastogaster (*Sphærocrema*) *pronotalis* Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Olokemeji, Nigeria (F. Silvestri).

50_1. Var. **behanzini** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 251 (☿).

Type locality: Kotonou, Dahomey.

50_2. Var. **dakarensis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 252 (☿).

Cremastogaster pronotalis var. *dakarensis* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 349 (☿).

Type locality: Dakar, Senegambia (F. Silvestri).

50_3. Var. **funerea** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 251 (☿).

Type locality: Molundu, Cameroon (Reichensperger).

50_4. Var. **liebknechti** (Forel). See p. 156.

Cremastogaster pronotalis var. *liebknechti* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 340 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Yakuluku; Garamba (Lang and Chapin).

51. **Crematogaster** (**Sphærocrema**) **rugosa** (Ern. André) Santschi, 1919, Rev. Zool. Afr., VII, p. 870.

Cremastogaster rugosa Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 348, fig. 17*c* (☿).

Crematogaster rugosa Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 484 (☿, ♀).

Type locality: Ogowe, French Congo (Mocquerys).

Ivory Coast: Bassam. Cameroon. Belgian Congo: Avakubi (J. Bequaert).

51_1. Var. **nigriventris** Santschi, 1919, Rev. Zool. Afr., VII, p. 87 (☿).

Type locality: Dimbroko, Ivory Coast (Le Moult).

51_2. Var. **rugaticeps** Santschi, 1919, Rev. Zool. Afr., VII, p. 87 (☿).

Type locality: Molundu, Cameroon (Reichensperger).

52. **Crematogaster** (**Sphærocrema**) **rugosior** (Santschi). See p. 156 (♀).

Cremastogaster luctans subsp. *rugosior* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 375 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 405 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: (Kohl); Stanleyville (Lang, Chapin and Bequaert).

53. **Crematogaster** (**Sphærocrema**) **sejuncta** (Stitz).

Cremastogaster sejuncta Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 387, fig. 6 (♀).

Type locality: Koloka near Angu, Belgian Congo (Schubotz).

54. **Crematogaster** (**Sphærocrema**) **similis** (Stitz).

Cremastogaster similis Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 388, fig. 7 (☿).

Cremastogaster (*Sphærocrema*) *similis* SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Mt. Karisimbi, north of Lake Kivu, BELGIAN CONGO (Schubotz).

55. **Crematogaster** (**Sphærocrema**) **striatula** EMERY.

Crematogaster striatulus EMERY, 1892, Ann. Soc. Ent. France, LXI, Bull., p. liii (☿); 1899, Ann. Soc. Ent. Belgique, XLIII, p. 482 (♀). H. KOHL, 1909, Natur u. Offenbarung, LV, pp. 103 and 167.

Cremastogaster striatula DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 86. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 374 (☿). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 141 (☿). SANTSCHI, 1911, Ann. Soc. Ent. Belgique, LV, p. 282; 1914, Deutsch. Ent. Zeitschr., p. 288 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 342 (☿).

Cremastogaster (*Sphærocrema*) *striatula* SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Assinie, IVORY COAST (C. Alluaud).

SIERRA LEONE. IVORY COAST: (Lohier). GOLD COAST: Aburi (F. Silvestri). CAMEROON: Duala (v. Rothkirch). SPANISH GUINEA: Alen (Tessmann). FRENCH CONGO: Gomba (A. Weiss).

55_1. Var. **benitensis** (SANTSCHI).

Cremastogaster striatula var. *benitensis* SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 374 (☿).

Type locality: River Benito, SPANISH GUINEA (de Brazza).

55_2. Var. **obstinata** (SANTSCHI). See p. 157.

Cremastogaster striatula var. *obstinata* SANTSCHI, 1911, Rev. Zool. Afr., I, p. 207 (☿).

Type locality: Gomba, FRENCH CONGO (A. Weiss).

BELGIAN CONGO: Leopoldville (J. Bequaert).

56. **Crematogaster** (**Sphærocrema**) **wilwerthi** (SANTSCHI).

Cremastogaster wilwerthi SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 372, fig. 6 (☿).

Type locality: Luki, BELGIAN CONGO (Wilwerth).

56_1. Var. **confusa** (SANTSCHI).

Cremastogaster wilwerthi var. *confusa* SANTSCHI, 1911, Rev. Zool. Afr., I, p. 208 (☿).

Type locality: Gomba, FRENCH CONGO (A. Weiss).

56_2. Var. **fauconneti** (FOREL).

Cremastogaster wilwerthi var. *fauconneti* FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 434 (☿).

Type locality: Nyangwe to Stanleyville, BELGIAN CONGO (Fauconnet).

Subgenus 3. **Orthocrema** SANTSCHI

Cremastogaster subg. *Orthocrema* SANTSCHI, 1918, Bull. Soc. Ent. France, p. 182.

Subgenotype: *Myrmica sordidula* Nylander, 1849.

57. **Crematogaster** (**Orthocrema**) **jeanneli** (SANTSCHI).

Cremastogaster jeanneli SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 100 (☿).

Type locality: River Tchania, 1520 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

58. **Crematogaster (Orthocrema) muralti** (Forel).

Cremastogaster muralti Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 432 (☿).

Type locality: Cameroon (L. v. Muralt).

58a. Subsp. **livingstonei** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 344 (☿).

Cremastogaster muralti subsp. *livingstonei* Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 536, fig. 50 (☿).

Type locality: Livingstone, Northern Rhodesia (G. Arnold).

58*b*. Subsp. **ugandensis** (Santschi).

Cremastogaster muralti subsp. *ugandensis* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 99 (☿).

Type locality: Unyoro Province, near Hoima, Uganda (C. Alluaud).

59. **Crematogaster (Orthocrema) pauciseta** Emery.

Crematogaster pauciseta Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 485, fig. (☿, ♀).

Cremastogaster pauciseta Forel, 1913, Rev. Suisse Zool., XXI, p. 669 (☿, ♀, ♂); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 340 (☿).

Cremastogaster (Orthocrema) pauciseta Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Cameroon (Conradt).

Belgian Congo: Kilongalonga near St. Gabriel (Kohl).

59a. Subsp. **dolens** (Forel).

Cremastogaster dolens Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433 (☿).

Type locality: Zanzibar (Voeltzkow).

59*b*. Subsp. **grossulior** (Forel).

Cremastogaster pauciseta subsp. *grossulior* Forel, 1916, Rev. Suisse Zool., XXIV, p. 404 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

60. **Crematogaster (Orthocrema) sordidula** (Nylander). See p. 1024.

Myrmica sordidula Nylander, 1849, Acta Soc. Sc. Fennicæ, III, 1, p. 44 (☿).

Crematogaster sordidula Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 472 (☿, ♀).

Cremastogaster sordidula Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 336 and 371. Arnold, 1920, Ann. South African Mus., XIV, p. 537.

Cremastogaster (Orthocrema) sordidula Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: not designated.

Southern Europe, North Africa, Syria, Turkestan.

The following records probably refer to some of the forms listed below: Transvaal: Johannesburg (Dixey and Longstaff). Cape Province: Nahoon River (Dixey and Longstaff).

60a. Subsp. **natalensis** (Forel).

Cremastogaster sordidula subsp. *natalensis* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 431 (☿, ♀, ♂); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 239 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 539 (☿, ♀, ♂).

Cremastogaster sordidula var. *natalensis* "Forel" Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 14 (without description).

Type locality: Mountains of Natal (R. C. Wroughton).

Basutoland: (R. C. Wroughton). Natal: Estcourt (R. C. Wroughton);

Krantz Kleof (Marley). Orange Free State: Bothaville (H. Brauns).

$60a_1$. Var. **braunsi** (Forel).

Cremastogaster sordidula subsp. *natalensis* var. *braunsi* Forel, 1911, Rev. Zool. Afr., I, p. 277 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 539 (☿).

Cremastogaster braunsi "Mayr" Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 432 (☿) (without description; this was never described by Mayr).

Type locality: Cape of Good Hope.

Natal: in the mountains; Estcourt (R. C. Wroughton).

60*b*. Subsp. **rectinota** (Forel).

Cremastogaster sordidula subsp. *rectinota* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 126 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 93 (☿, ♀).

Cremastogaster sordidula var. *rectinota* Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 537 (☿, ♀), Pl. vi, fig. 73.

Type locality: Bulawayo, Rhodesia (G. Arnold).

British East Africa: River Ramisi (Alluaud and Jeannel). German East Africa: Tanga (Alluaud and Jeannel).

61. **Crematogaster (Orthocrema) transvaalensis** (Forel).

Cremastogaster transvaalensis Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 96 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 533 (☿).

Crematogaster transwaalensis Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 30 (☿), Pl. ii, fig. 18.

Type locality: Transvaal (P. Berthoud).

Cape Province: Cape Town; Vrijburg (E. Simon).

61_1. Var. **hammi** (Arnold).

Cremastogaster transvaalensis var. *hammi* Arnold, 1920, Ann. South African Mus., XIV, p. 534, fig. 48 (☿).

Type locality: not indicated; probably in Rhodesia (G. Arnold).

Subgenus 4. **Atopogyne** Forel

Cremastogaster subg. *Atopogyne* Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 343.

Cremastogaster subg. *Atopogynes* Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Subgenotype: *Formica depressa* Latreille, 1802.

62. **Crematogaster (Atopogyne) africana** (Mayr).

Cremastogaster africana Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 142 (☿); 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 294 (☿). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 53 and 69 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 378. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433. Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 145.

Crematogaster africana Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 480, fig. (☿). H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 164 and 168.

Cremastogaster buchneri subsp. *africana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 352 (☿).

Cremastogaster (Atopogynes) africana Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Type locality: Warship harbor in Cameroon (H. Brauns).

Gold Coast: Aburi (R. Buchholz). Nigeria: Old Calabar. Cameroon: Duala (v. Rothkirch). French Congo: Brazzaville; Mindouli (A. Weiss). Belgian Congo: (Kohl); Mayombe (Cabra; de Briey); Kondué (Luja).

62_1. Var. **biemarginata** (Forel).

Cremastogaster africana var. *biemarginata* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433 (☿).

Type locality: Cameroon.

62_2. Var. **camena** (Forel).

Cremastogaster buchneri subsp. *africana* var. *camena* Forel, 1916, Rev. Suisse Zool., XXIV, p. 410 (☿).

Type locality: Olombo, Belgian Congo (Kohl).

62_3. Var. **schumanni** (Mayr). See p. 157.

Cremastogaster buchneri subsp. *schumanni* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144 (☿).

Type locality: Cameroon (C. Schumann).

Belgian Congo: Leopoldville (J. Bequaert).

62_4. Var. **stanleyi** (Santschi).

Crematogaster buchneri subsp. *africana* var. *stanleyi* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 253 (☿).

Cremastogaster africana var. *stanleyi* Forel, 1911, Rev. Zool. Afr., I, p. 278 (☿; without description).

Type locality: Mindouli, French Congo (A. Weiss).

Belgian Congo: Kondué (Luja).

62_5. Var. **variegata** (Mayr).

Cremastogaster africana var. *variegata* Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 294 (☿).

Type locality: Victoria, Cameroon (R. Buchholz).

62a. Subsp. **alligatrix** (Forel).

Cremastogaster buchneri subsp. *alligatrix* Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 271 (☿); 1911, Rev. Zool. Afr., I, p. 278 (☿); 1913, ibid., II, p. 352 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 351 (☿); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 338 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 442 (☿). Farquharson, 1919, ibid., (1918), Proc., p. xl.

Type locality: Old Calabar, Nigeria (Bates).

Southern Nigeria: Oni Camp, east of Lagos (Lamborn). Belgian Congo: St. Gabriel (Kohl); Kondué (Luja); Mayombe (De Briey).

62*b*. Subsp. **laurenti** (Forel) Santschi *in litt.* See p. 157.

Cremastogaster africana subsp. *laurenti* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 69 (☿).

Crematogaster africana subsp. *laurentii* H. Kohl, 1909, Natur u. Offenbarung, LV, pp. 160, 164, and 168.

Cremastogaster buchneri subsp. *laurenti* Forel, 1913, Rev. Zool. Afr., II, p. 352 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 442 (☿).

Type locality: Bokala, Belgian Congo (Laurent).

Southern Nigeria: Oni Camp east of Lagos (Lamborn). Belgian Congo: Isangi; Stanleyville (Laurent); Tshopo River near Stanleyville (J. Bequaert).

$62b_1$. Var. **zeta** (Forel). See p. 157.

Cremastogaster africana subsp. *laurenti* var. *zeta* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 70 (☿).

Type locality: Belgian Congo (Laurent; Kohl).

Belgian Congo: Pale (Niembo) between Walikale and Lubutu; Leopoldville (J. Bequaert); Stanleyville (Lang and Chapin).

62*c*. Subsp. **tibialis** Santschi. See p. 157 (☿).

Type locality: Mosekowa between Walikale and Lubutu, Belgian Congo (J. Bequaert).

62*d*. Subsp. **winkleri** (Forel).

Cremastogaster africana var *winkleri* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 69 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 272 (☿); 1911, Rev. Zool. Afr., I, p. 278 (☿). Aulmann and La Baume, 1912, 'Fauna d. Deutsch. Kolon.,' V, 3, p. 63, fig. 36 (nest). Aulmann, 1913, ibid., V, 5, p. 93, fig. 79 (nest).

Cremastogaster buchneri subsp. *winkleri* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 124 (☿, ♀); 1913, Rev. Zool. Afr., II, pp. 324 and 352 (☿); 1913, Rev. Suisse Zool., XXI, p. 670. Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 442 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 409 (☿).

Cremastogaster africana var. *winkleri* L. Reh, 1905, Zeitschr. f. Pflanzenkrankh., XV, p. 134 (without description).

Type locality: Victoria, Cameroon (H. Winkler).

Nigeria: Oni Camp east of Lagos (Lamborn); Old Calabar (Bates). Cameroon: Johann-Albrechtshöhe (Conradt). Belgian Congo: Olombo (Kohl); Eala; Bokala (Laurent); Kondué (Luja). Rhodesia: (G. Arnold).

62d_1. Var. brieyi (Forel).

Cremastogaster buchneri subsp. *winkleri* var. *brieyi* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 352 (☿).

Type locality: Mayombe, Belgian Congo (de Briey).

62d_2. Var. fickendeyi (Forel). See p. 158.

Cremastogaster buchneri subsp. *winkleri* var. *fickendeyi* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 125 and 351 (☿); 1913, Rev. Zool. Afr., II, p. 324; 1916, Rev. Suisse Zool., XXIV, p. 409 (☿).

Type locality: Victoria, Cameroon (Fickendey).

Belgian Congo: Kondué (Luja); Leopoldville; St. Gabriel (Kohl); Masongo between Walikale and Lubutu (J. Bequaert).

62d_3. Var. transversiruginota (Forel).

Cremastogaster buchneri subsp. *winkleri* var. *transversiruginota* Forel, 1916, Rev. Suisse Zool., XXIV, p. 410 (☿).

Type locality: Motombe, Okiavo River, Belgian Congo (Kohl).

63. **Crematogaster (Atopogyne) angusticeps** (Santschi).

Cremastogaster angusticeps Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 354, fig. (☿).

Type locality: Sikasso, French Sudan (Chevalier).

64. **Crematogaster (Atopogyne) batesi** (Forel).

Cremastogaster batesi Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 270 (☿).

Type locality: Old Calabar, Nigeria (Bates).

65. **Crematogaster (Atopogyne) buchneri** (Forel).

Cremastogaster buchneri Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 94 (☿). Mayr, 1895 Ann. Naturh. Hofmus. Wien, X, p. 138 (☿). Forel, 1913, Rev. Suisse Zool., XXI, p. 669 (♀). Arnold, 1920, Ann. South African Mus., XIV, pp. 487 and 520 (☿).

Crematogaster buchneri Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 479, fig. (☿, ♀).

Cremastogaster (Atopogynes) buchneri Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Type locality: Benguela (M. Buchner).

Cameroon: (Conradt). Angola.

65_1. Var. **biimpressa** (Mayr).

Cremastogaster buchneri subsp. *biimpressa* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 139 (☿).

Type locality: Kuilu River, French Congo.

65_2. Var. **græteri** (Forel).

Cremastogaster buchneri var. *græteri* Forel, 1916, Rev. Suisse Zool., XXIV, p. 409 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

65a. Subsp. **clariventris** (Mayr).

Cremastogaster buchneri subsp. *clariventris* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 139 (☿); 1896, Ent. Tidskr., XVII, p. 242 (☿). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 271 (♀); 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 180; 1913, Ann. Soc. Ent. Belgique, LVII, p. 351 (☿); 1913, Rev. Zool. Afr., II, p. 352 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 442 (☿).

Type locality: Loango Coast, French Congo (H. Brauns).

Liberia: (Scherer). Southern Nigeria: Oni Camp east of Lagos (Lamborn). Cameroon: (Sjöstedt). Belgian Congo: Kondué (Luja). Uganda: Entebbe (Schultze).

66. **Crematogaster (Atopogyne) bulawayensis** (Forel).

Cremastogaster buchneri subsp. *africana* var. *bulawayensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 125 (☿).

Cremastogaster gallicola var. *oraclum* Forel, 1913, Rev. Zool. Afr., II, p. 323 (☿). Bequaert, ibid., p. 425. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 124 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 237 (☿). (Synonym of *bulawayensis*, *teste* Arnold).

Cremastogaster bulawayensis Arnold, 1920, Ann. South African Mus., XIV, p. 521, fig. 42 (☿), Pl. vi, figs. 74 and 74a.

Type locality: Bulawayo, Rhodesia (G. Arnold).

Belgian Congo: Sankisia (J. Bequaert).

66_1. Var. **desperans** (Forel).

Cremastogaster gabonensis var. *desperans* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 233 (☿).

Cremastogaster desperans Santschi, 1918, Bull. Soc. Ent. France, p. 185.

Cremastogaster bulawayensis var. *desperans* Arnold, 1920, Ann. South African Mus., XIV, p. 523, fig. 44 (☿).

Type locality: Durban, Natal (G. Arnold).

66_2. Var. **rhodesiana** (Forel).

Cremastogaster inermis subsp. *delagoensis* var. *rhodesiana* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 126 (☿).

Cremastogaster bulawayensis var. *rhodesiana* Arnold, 1920, Ann. South African Mus., XIV, p. 523, fig. 43 (☿), Pl. vi, figs. 82 and 82a.

Type locality: Bulawayo, Rhodesia (G. Arnold).

66_3. Var. **zulu** (Santschi).

Cremastogaster sjostedti subsp. *bulawayensis* var. *zulu* Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 15 (☿, ♀).

Type locality: Mfongosi, Zululand (W. E. Tones).

66a. Subsp. **infaceta** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 498 (☿).

Cremastogaster vulcanica var. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 124 (☿).

Cremastogaster vulcania subsp. *godefreyi* var. *foraminicipoides* Forel, 1916, Rev. Suisse Zool., XXIV, p. 406 (☿).

Cremastogaster sjostedti subsp. *infaceta* Santschi, 1918, Bull. Soc. Ent. France, p. 184.

Cremastogaster godfreyi var. *foraminicipoides* Arnold, 1920, Ann. South African Mus., XIV, p. 505 (☿).

Cremastogaster bulawayensis subsp. *infaceta* Arnold, ibid., 1920, XIV, p. 524 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

Rhodesia: Bulawayo (G. Arnold).

$66a_1$. Var. **pudica** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 499 (☿).

Cremastogaster bulawayensis subsp. *infaceta* var. *pudica* Arnold, 1920, Ann. South African Mus., XIV, p. 525 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

67. **Crematogaster (Atopogyne) depressa** (Latreille).

Formica depressa Latreille, 1802, 'Hist. Nat. Fourmis,' p. 268 (♀), Pl. xi, fig. 73. Roger, 1863, 'Verzeich. Formicid.,' p. 33. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 414.

Formica platygnatha Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 168 (♀); 1863, 'Verzeich. Formicid.,' p. 15. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 419.

Cremastogaster mandibularis Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 229 (♀).

Cremastogaster platygnatha Ern. André, 1890, ibid., IX, p. 323 (♀).

Crematogaster depressa Emery, 1892, Bull. Soc. Ent. Italiana, XXIII, p. 164; 1899, Ann. Soc. Ent. Belgique, XLIII, p. 478, fig. (♀).

Cremastogaster depressa Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 81. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♀, ♂).

Cremastogaster buchneri subsp. *foreli* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 138 (☿). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (☿).

Cremastogaster (Atopogynes) depressa Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 351 (♀); 1918, Bull. Soc. Ent. France, p. 183.

Cremastogaster (Atopogynes) depressa subsp. *foreli* Santschi, 1914, Boll. Lab. Gen. Agrar. Portici, VIII, p. 351 (☿).

Type locality: Coast of Guinea (Palisot de Beauvois).

West Africa: (Fulleborn). Senegambia. French Guinea: Los Islands. Sierra Leone: (Mocquerys). Gold Coast. Slave Coast. Southern Nigeria: Lagos; Olokemeji; Ibadan (F. Silvestri); Old Calabar (H. Brauns). Cameroon: Victoria. Belgian Congo: Luki (A. Jullien).

67_1. Var. **adultera** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 252 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

67_2. Var. **fuscipennis** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 479 (♀). See p. 159.

Cremastogaster depressa var. *fuscipennis* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 380, figs. *8b–c* and *9a–c* (☿, ♀, ♀ ergatom.). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♀, ♂); 1911, Rev. Zool. Afr., I, p. 279 (♀); 1913, ibid., II, p. 325 (♀); 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (♀).

Type locality: Cameroon.

French Congo: Gomba region (A. Weiss). Belgian Congo: Kinshasa; Boyengue; Ikelemba (Waelbroeck); Leopoldville (Dubois; J. Bequaert); Sankisia (J. Bequaert); Mayombe (Deleval); Stanleyville; Medje; Niapu; Ambelokudi; Niangara (Lang and Chapin).

68. **Crematogaster (Atopogyne) gabonensis** Emery.

Crematogaster gabonensis Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 484 (☿).

Cremastogaster gabonensis Santschi, 1911, ibid., LV, p. 281 (♂). Forel, 1913, ibid., LVII, p. 126 (☿).

Type locality: Gaboon, French Congo.

Ivory Coast: (Lohier). Cameroon: Victoria (Fickendey).

68_1. Var. **fuscitatis** (Forel).

Cremastogaster gabonensis var. *fuscitatis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 351 (♀).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: Congo da Lemba (R. Mayné).

69. **Crematogaster (Atopogyne) homeri** (Forel).

Cremastogaster (Atopogyne) homeri Forel, 1913, Rev. Suisse Zool., XXI, p. 668 (♀).

Type locality: Johann-Albrechtshöhe, Cameroon (Conradt).

70. **Crematogaster (Atopogyne) jullieni** (Santschi).

Cremastogaster jullieni Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 378, figs. *8a* and *8d* (☿, ♀). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 5 (♀).

Cremastogaster (Atopogyne) jullieni Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 343.

Cremastogaster (Atopogynes) julieni Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Type locality: Brazzaville, French Congo (A. Weiss).

West Africa: (Fülleborn). French Congo: Gaboon.

71. **Crematogaster (Atopogyne) kasaiensis** (Forel).

Cremastogaster kasaiensis Forel, 1913, Rev. Zool. Afr., II, p. 321 (☿, ♀); 1916, Rev. Suisse Zool., XXIV, p. 407 (☿, ♀).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: St. Gabriel (Kohl).

72. **Crematogaster (Atopogyne) kohli** (Forel).

Cremastogaster kohli Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 70 and 71 (☿); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 340 (☿, ♀).

Type locality: Stanleyville, Belgian Congo (Kohl).

Belgian Congo: Romée near Stanleyville (Luja); St. Gabriel (Kohl).

73. **Crematogaster (Atopogyne) theta** (Forel) Santschi *in litt.* See p. 159.

Cremastogaster africana var. *theta* Forel, 1911, Rev. Zool. Afr., I, p. 278 (☿).

Cremastogaster buchneri subsp. *laurenti* var. *theta* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 125 and 352 (☿); 1913, Rev. Zool. Afr., II, p. 325; 1916, Rev. Suisse Zool., XXIV, p. 410 (☿, ♀).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: St. Gabriel (Kohl); Medje; Avakubi; Stanleyville (Lang and Chapin).

74. **Crematogaster (Atopogyne) transiens** (Forel) Santschi *in litt.* See p. 160.

Cremastogaster buchneri subsp. *transiens* Forel, 1913, Rev. Zool. Afr., II, p. 324 (☿). Bequaert, ibid., p. 426. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 253.

Type locality: Kana near Kikondja, Belgian Congo (J. Bequaert).

Belgian Congo: Kataki (Gérard); Avakubi; Stanleyville (Lang and Chapin).

75. **Crematogaster (Atopogyne) wasmanni** (Santschi).

Cremastogaster wasmanni Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 376, fig. 7 (☿).

Cremastogaster (Atopogynes) wasmanni Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Type locality: Sankuru, Belgian Congo (Luja).

76. **Crematogaster (Atopogyne) wellmani** (Forel).

Cremastogaster wellmani Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 64 (☿; *nec* ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 376 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 433 (☿).

Crematogaster (Atopogynes?) welmani Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 500 (♀).

Type locality: Benguela (C. Wellman).

Nigeria: Old Calabar. French Congo: Brazzaville (A. Weiss); Libreville.

76_1. Var. **luciæ** (Forel).

Crematogaster concava Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 480 (♀) (*nec* ☿; *nec concava* André).

Cremastogaster (Atopogyne) luciæ Forel, 1913, Rev. Zool. Afr., II, p. 325 (♀); 1913, Ann. Soc. Ent. Belgique, LVII, p. 353 (♀); 1913, Rev. Suisse Zool., XXI, p. 668 (♀); 1916, ibid., XXIV, p. 411 (♀).

Crematogaster (Atopogynes?) welmani var. *luciæ* Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 500 (♀).

Type locality: Sierra Leone.

Cameroon: (Conradt). Belgian Congo: (Kohl); Kwesi to Kilo (Bayer).

76_2. Var. **weissi** Santschi.

Cremastogaster wellmani var. *weissi* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 376 (☿).

Crematogaster welmani var. *weissi* Santschi, 1916, ibid., LXXXIV, (1915), p. 500 (♀).

Type locality: Gomba, French Congo (A. Weiss).

76a. Subsp. **retusa** Santschi.

Crematogaster welmani subsp. *retusa* Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 500 (☿, ♀, ♂).

Cremastogaster (Atopogyne) welmani subsp. *retusa* Arnold, 1920, Ann. South African Mus., XIV, pp. 486 and 545, fig. 54 (☿, ♀, ♂).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

Subgenus 5. **Oxygyne** Forel

Cremastogaster subg. *Oxygyne* Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 376.

Cremastogaster subg. *Oxygynes* Santschi, 1918, Bull. Soc. Ent. France, p. 183.

Subgenotype: *Cremastogaster (Oxygyne) daisyi* Forel, 1901.

77. **Crematogaster (Oxygyne) magitæ** (Forel).

Cremastogaster (Oxygyne?) magitæ Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 9 (♀); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 369.

Type locality: West Africa (Fülleborn).

78. **Crematogaster (Oxygyne) margaritæ** Emery.

Crematogaster margaritæ Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 31 (♀).

Cremastogaster margaritæ Mayr, 1896, Ent. Tidskr., XVII, p. 243 (☿, ♀, ♂). Aurivillius, ibid., p. 254, Pl. iv, fig. 2 (nest). Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 504, fig. 2 (nest).

Cremastogaster (Oxygyne) margaritæ Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 381, fig. 8c (♀).

Type locality: Kuilu, French Congo.

Cameroon: (Sjöstedt). French Congo: Brazzaville (A. Weiss).

78a. Subsp. **lujæ** (Forel).

Cremastogaster (Oxygyne) margaritæ subsp. *lujæ* Forel, 1913, Rev. Zool. Afr., II, p. 325 (♀).

Type locality: Kondué, Belgian Congo (Luja).

79. **Crematogaster (Oxygyne) oscaris** (Forel).

Cremastogaster (Oxygyne) oscaris Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 7 (☿, ♀, ♂), Pl. i, figs. 5 and 6. Arnold, 1920, Ann. South African Mus., XIV, p. 543 (☿, ♀, ♂).

Type locality: Kamaggas, Cape Province (L. Schultze).

80. **Crematogaster (Oxygyne) santschii** (Forel).

Cremastogaster santschii, Forel, 1913, Rev. Zool. Afr., II, p. 322 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 352 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 487 (☿).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: Congo da Lemba (R. Mayné).

80_1. Var. **brevarmata** (Forel).

Cremastogaster santschii var. *brevarmata* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 337 (☿, ♂).

Type locality: Kondué, Belgian Congo (Luja).

80_2. Var. **clymene** (Forel).

Cremastogaster santschii var. *clymene* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 337 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 540, fig. 52 (☿).

Type locality: Durban, Natal (C. B. Cooper).

81. **Crematogaster (Oxygyne) trautweini** (Viehmeyer).

Cremastogaster (Oxygyne) trautweini Viehmeyer, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 33 (☿).

Type locality: Cameroon (H. Trautwein).

Subgenus 6. **Nematocrema** Santschi

Cremastogaster subg. *Nematocrema* Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Subgenotype: *Cremastogaster stadelmanni* Mayr, 1895.

82. **Crematogaster (Nematrocrema) breviventris** (Santschi).

Cremastogaster (Nematocrema) breviventris Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 379 (☿).

Type locality: Molundu, Cameroon (Reichensperger).

83. **Crematogaster (Nematocrema) stadelmanni** (Mayr). See p. 160.

Cremastogaster stadelmanni Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 140 (☿, ♀); 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 294 (☿). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 380. Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 369 (☿).

Cremastogaster (Oxygyne) stadelmanni Forel, 1911, Rev. Zool. Afr., I, p. 277 (☿); 1913, Rev. Suisse Zool., XXI, p. 670 (♀); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 337 (☿); 1916, Rev. Suisse Zool., XXIV, p. 411 (☿).

Cremastogaster (Oxygynes) stadelmanni Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 349 (☿).

Cremastogaster (Nematocrema) stadelmanni Santschi, 1918, Bull. Soc. Ent. France, p. 182.

Type locality: Liberia.

French Guinea: Konakry (F. Silvestri). Cameroon: (Conradt); Victoria (R. Buchholz). Belgian Congo: Congo da Lemba (Mayné); St. Gabriel (Kohl); Stanleyville (Lang and Chapin). British East Africa: Victoria Nyanza (Zimmer). Cape Province: Simon's Town (E. Simon).

83_1. Var. **anguliceps** (Stitz).

Cremastogaster (Oxygyne) stadelmanni var. *anguliceps* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 384, fig. 4*b* (☿).

Type locality: Ossidinge, Cameroon.

83_2. Var. **angustata** (Mayr).

Cremastogaster stadelmanni var. *angustata* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 142 (☿).

Type locality: Cameroon (H. Brauns).

83_3. Var. **dolichocephala** (Santschi). See p. 160.

Cremastogaster stadelmanni var. *dolichocephala* Santschi, 1911, Rev. Zool. Afr., I, p. 208, with description (☿, ♀, ♂); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 349, with description (☿). Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 337 (☿).

Cremastogaster stadelmanni subsp. *dolichocephala* "Emery *in litt.*" Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 378 (without description). Wasmann, 1911, '1^er^ Congr. Intern. Entom. Bruxelles (1910),' II, Mém., p. 231, Pl. xvi, fig. 32 (nest); 1913, Ann. Rept. Smiths. Inst. for 1912, p. 472, Pl. x, fig. 32 (nest).

Type locality: Brazzaville, French Congo (A. Weiss).

Nigeria: Ibadan (F. Silvestri). French Congo: Mindouli; Gomba (A. Weiss). Belgian Congo: St. Gabriel (Kohl); Bengamisa; Manamana; Kwamouth; Ngayu (Lang and Chapin); Kondué (Luja).

83_4. Var. **intermedia** (Mayr).

Cremastogaster stadelmanni var. *intermedia* Mayr, 1896, Ent. Tidskr., XVII, p. 242 (☿, ♀). Aurivillius, ibid., p. 254, Pl. v (nest). Sjöstedt, 1904, 'I Västafrikas Urskogar,' pp. 502 and 503, fig. (nest).

Type locality: Cameroon (Sjöstedt).

83_5. Var. **ovinodis** (Stitz).

Cremastogaster (Oxygyne) stadelmanni var. *ovinodis* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 383, fig. 4*d* (☿).

Type locality: Duma, Belgian Congo (Schubotz).

83_6. Var. **schereri** (Forel).

Cremastogaster stadelmanni var. *schereri* Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 273 (☿).

Type locality: Bendov, Liberia (Scherer).

Subgenus 7. **Decacrema** Forel

Cremastogaster subg. *Decacrema* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 18; in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 9.

Subgenotype: *Cremastogaster (Decacrema) decamera* Forel, 1910.

84. **Crematogaster (Decacrema) arthuri-mülleri** (Forel).

Cremastogaster gallicola subsp. *arthuri-mülleri* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 96 (☿).

Cremastogaster arthuri-mülleri Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144 (☿).

Cremastogaster (Decracrema) arthur-mülleri Arnold, 1920, Ann. South African Mus., XIV, p. 547 (☿).

Type locality: Delagoa (Arthur Müller).

East Africa.

85. **Crematogaster (Decacrema) edentula** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 253 (♀).

Cremastogaster (Decacrema) edentula Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 349, figs. 18*a*-*b* (☿, ♀).

Type locality: Kindia, French Guinea (F. Silvestri).

Dahomey: Kouandé (Desanti).

86. **Crematogaster (Decacrema) liengmei** (Forel).

Cremastogaster gallicola var. *liengmei* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 96 (☿).

Cremastogaster lieugmei Wasmann, 1898, Wien. Ent. Zeitg., XVII, p. 97.

Cremastogaster (Decacrema) liegmei Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 436 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 21 (☿).

Cremastogaster liengmei Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, p. 6.

Cremastogaster (Decracrema) liengmei Arnold, 1920, Ann. South African Mus., XIV, p. 548 (☿).

Type locality: Delagoa (Liengme).

Natal: (L. v. Muralt); Balgowan (I. Trägårdh).

86*a*. Subsp. **caculata** (Forel).

Cremastogaster peringueyi subsp. *caculata* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 341 (☿).

Cremastogaster liengmei subsp. *caculata* Arnold, 1920, Ann. South African Mus., XIV, p. 550 (☿).

Type locality: Durban, Natal (C. B. Cooper).

86*b*. Subsp. **weitzeckeri** (Emery).

Cremastogaster weitzeckeri Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 28 (☿), Pl. II, figs. 14 and 15.

Cremastogaster (*Decacrema*) *liengmei* var. *weitzekeri* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 21 (☿).

Cremastogaster weitzecheri Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 371.

Cremastogaster excisa subsp. *andrei* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 236 (☿, according to Arnold, with 10-jointed antennæ).

Cremastogaster cælestis var. *kloofensis* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 237 (☿, *teste* Arnold).

Cremastogaster (*Decracrema*) *liengmei* subsp. *weitzæckeri* Arnold, 1920, Ann. South African Mus., XIV, p. 548, fig. 55 (☿).

Type locality: Pietermaritzburg, Natal (Weitzecker; I. Trägårdh).

Natal: Estcourt (R. C. Wroughton); Krantz Kloof, Durban (Marley). Cape Province: Cape Town (E. Simon); Nahoon River (Dixey and Longstaff).

86b_1. Var. **acanthobia** (Forel).

Cremastogaster excisa subsp. *andrei* var. *acanthobia* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 236 (☿).

Cremastogaster excisa subsp. *andrei* var. *pensitata* Forel, 1915, ibid., (5) L, p. 341 (☿).

Cremastogaster liengmei subsp. *weitzæckeri* var. *acanthobia* Arnold, 1920, Ann. South African Mus., XIV, p. 550 (☿).

Type locality: Willowmore, Cape Colony (Arnold).

86b_2. Var. **gordonensis** (Forel).

Cremastogaster excisa subsp. *andrei* var. *gordonensis* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 236 (☿).

Cremastogaster liengmei subsp. *weitzæckeri* var. *gordonensis* Arnold, 1920, Ann. South African Mus., XIV, p. 549 (☿).

Type locality: Gordon Bay, Cape Province.

86b_3. Var. **thais** (Forel).

Cremastogaster excisa subsp. *andrei* var. *thais* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 126 (☿).

Cremastogaster liengmei subsp. *weitzæckeri* var. *thais* Arnold, 1920, Ann. South African Mus., XIV, p. 549 (☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

Cape Province: Grahamstown (Sherry).

87. **Crematogaster** (**Decacrema**) **petiolidens** (Forel).

Cremastogaster (*Decacrema*) *petiolidens* Forel, 1916, Rev. Suisse Zool., XXIV, p. 412 (☿).

Type locality: Belgian Congo (Kohl).

88. **Crematogaster (Decacrema) solenopsides** Emery.

Crematogaster solenopsides Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 487 (☿).

Type locality: Zanzibar.

88a. Subsp. **costeboriensis** (Santschi).

Crematogaster (Decacrema) solenopsoides subsp. *costeboriensis* Santschi, 1919, Rev. Zool. Afr., VII, p. 86 (☿).

Type locality: Region of San Pedro, Ivory Coast (C. Phore).

88*b*. Subsp. **flavida** (Mayr).

Cremastogaster solenopsides subsp. *flavida* Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 15 (☿).

Cremastogaster solenopsides var. *flavida* Sjöstedt, 1908, ibid., II, 8, p. 117.

Type locality: Same to Moëmbe, Usambara, German East Africa (Sjöstedt).

88b_1. Var. **convexiclypea** (Forel).

Cremastogaster (Decacrema) solenopsisoides subsp. *flavida* var. *convexiclypea* Forel, 1916, Rev. Suisse Zool., XXIV, p. 411 (☿, ♀, ♂).

Type locality: St. Gabriel, Belgian Congo (Kohl).

88b_2. Var. **flaviscapis** (Santschi).

Crematogaster solenopsoides subsp. *flavida* var. *flaviscapis* Santschi, 1919, Rev. Zool. Afr., VII, p. 85 (☿).

Type locality: Landana, Portuguese Congo (J. Bequaert).

88b_3. Var. **gallarum** (Santschi).

Cremastogaster solenopsides subsp. *flavida* var. *gallarum* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 370 (☿).

Crematogaster solenopsoides subsp. *flavida* var. *gallarum* Santschi, 1919, Rev. Zool. Afr., VII, p. 86.

Type locality: Mindouli, French Congo (A. Weiss).

French Congo: Mbamu (A. Weiss).

Solenopsidini Emery

Monomorium Mayr

Monomorium Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 452.

Atta (part) Jerdon. *Formica* (part) Linnæus, *et auct.* *Myrmica* (part) F. Smith, *et auct.*

Genotype: *Monomorium minutum* Mayr, 1855.

Subgenus 1. **Monomorium** Mayr, *sensu stricto*

Subgenotype: same as genotype.

1. **Monomorium altinode** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 18.

Monomorium rhopalocerum var. *altinodis* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 359, fig. 4*b* (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

1_1. Var. **bondroiti** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 10, fig. 1*f* (☿).

Type locality: Upper Lukuga River, Belgian Congo (Gérard).

2. **Monomorium angustinode** Forel, 1913, Rev. Zool. Afr., II, p. 334 (☿). Bequaert, ibid., p. 428.

Type locality: Welgelegen, Belgian Congo (J. Bequaert).

3. **Monomorium arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 137 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 232 (☿).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

4. **Monomorium braunsi** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 7 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 234 (☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

4_1. Var. **shilohense** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 217 (♀). Arnold, 1916, Ann. South African Mus., XIV, p. 235 (☿).

Type locality: Shiloh, Southern Rhodesia (G. Arnold).

5. **Monomorium egens** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 443 (☿).

Type locality: Cameroon (v. Muralt).

6. **Monomorium emeryi** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 132 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 136 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 212 (☿, ♀, ♂), Pl. v, fig. 62.

Type locality: Mozambique Island, Portuguese East Africa (H. Brauns). Rhodesia: Redbank; Nyamandhloru (G. Arnold).

7. **Monomorium explorator** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 12, fig. 1*a–b* (☿).

Type locality: Samkita, French Congo (F. Faure).

8. **Monomorium fasciatum** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 10, fig. 1*c–e* (☿).

Type locality: Kilimanjaro, German East Africa (Reichensperger).

9. **Monomorium floricola** (Jerdon) Emery, in Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 66. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿, ♀). See p. 1026.

Atta floricola Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 107; 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 49 (☿).

Monomorium specularis Mayr, 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 509 (☿); 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 671.

Type locality: Tellicherry, Southern India (Jerdon).

Tropicopolitan. Southern Nigeria: Lagos (F. Silvestri).

10. **Monomorium hanneli** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 18 (☿).

Type locality: Mte-ya-Kifaru, German East Africa (Katona).

11. **Monomorium ilgi** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 84 (☿).

Type locality: Southern Abyssinia (Ilg).

12. **Monomorium leimbachi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 246 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 233 (☿).

Type locality: Cape Town, Cape Province (G. Arnold).

13. **Monomorium lene** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 11, fig. 2*g–h* (☿).

Type locality: Salisbury, Southern Rhodesia (G. Arnold).

14. **Monomorium mediocre** Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 376, fig. 13 (☿).

Type locality: Kimberley, Cape Province (G. Arnold).

15. **Monomorium minutum** Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 453 (☿); 1861, 'Europ. Formicid., p. 72 (☿); 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 753 (☿). Roger, 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1865, 'Reise Novara Zool.,' II, 1, Formicidæ, p. 91 (♀, ♂); 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 509 (♀). Ern. André, 1874, Rev. Mag. Zool., (3) II, p. 199; 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 333, 338, and 341 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 67. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 72 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 217 (☿). See p. 1027.

Myrmica (Monomarium) minuta F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 129 (☿).

Monomorium carbonarium Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 532 (☿).

Type locality: Lombardy, Italy (Villa).

Uganda: Region of Lake Albert (C. Alluaud).

15_1. Var. **leopoldinum** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 179 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

15_2. Var. **pallidipes** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 252 (☿). Santschi, 1914, 'Voy. Alluaud and Jeannel Afr. Orient., Formicidæ,' p. 72 (☿).

Type locality: Nefasit, Eritrea (K. Escherich).

British East Africa: Kikuyu, Nairobi, 1700 m. (Alluaud and Jeannel).

15*a*. Subsp. **boerorum** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 244 (☿, ♀). Arnold, 1916, Ann. South African Mus., XIV, p. 218 (☿, ♀).

Monomorium minutum var. *boerorum* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 442 (☿).

Type locality: Orange Free State (R. C. Wroughton).

Cape Province: Cape Town (L. Péringuey; Phillip).

15*b*. Subsp. **hottentotum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 26 (♀). Arnold, 1916, Ann. South African Mus., XIV, p. 218 (♀).

Type locality: Cape Town, Cape Province (E. Simon).

15*c*. Subsp. **madecassum** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 255 (☿, ♀, ♂); 1907, Ann. Mus. Nat. Hungarici, V, p. 18 (☿). See p. 1027.

Monomorium minutum Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 164 (☿, ♀, ♂).

German East Africa: Mto-ya-Kifaru (Katona).

16. **Monomorium mœstum** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 74, fig. 7 (☿).

Type locality: Naivasha, Rift Valley, 1900 m., British East Africa (Alluaud and Jeannel).

17. **Monomorium opacum** Forel, 1913, Rev. Zool. Afr., II, p. 333 (☿). Bequaert, ibid., p. 428.

Type locality: Shinsenda, Belgian Congo (J. Bequaert).

18. **Monomorium ophthalmicum** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 87 (☿).

Type locality: Southern Abyssinia (Ilg).

19. **Monomorium oscaris** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 86 (☿). Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 61 (☿).

Type locality: Southern Abyssinia (Ilg).

Eritrea: Ghinda (Belli).

19_1. Var. **excensuræ** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 342 (☿).

Type locality: Kentani, Cape Province (Miss A. Pegler).

19_2. Var. **nuptiale** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 216 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 229 (☿).

Type locality: Bembesi, Rhodesia (G. Arnold).

Rhodesia: Bulawayo (G. Arnold).

19*a*. Subsp. **musicum** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 442 (☿, ♀). Arnold, 1916, Ann. South African Mus., XIV, p. 230 (☿, ♀).

Type locality: Natal (Haviland).

19*b*. Subsp. **springvalense** Forel, 1913, Bull. Soc. Ent. Belgique, LVII, p. 136 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 230 (☿).

Type locality: Springvale, Matoppos, Southern Rhodesia (G. Arnold).

19b_1. Var. **paternum** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 248 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 231 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 418 (☿).

Type locality: Table Mt., 1800 ft., Cape Province (G. Arnold).

Belgian Congo: St. Gabriel (Kohl).

20. **Monomorium osiridis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 258, fig. 7 (☿).

Type locality: Bura, British East Africa (Alluaud and Jeannel).

21. **Monomorium pacis** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 343 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 234 (☿).

Type locality: Cape Town, Cape Province.

22. **Monomorium pharaonis** (Linnæus) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 752; 1863, ibid., XIII, p. 429. Roger, 1863, 'Verzeich. Formicid.,' p. 32. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 90 (♂); 1867, Tijdschr. v. Ent., X, p. 95 (☿, ♀, ♂). Frauenfeld, 1867, Verh. Zool. Bot. Ges. Wien, XVII, p. 441. Ern. André, 1874, Rev. Mag. Zool., (3) II, p. 200. Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 368 (☿, ♀). Saunders, 1880, Trans. Ent. Soc. London, p. 222 (☿, ♀, ♂). Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 532 (☿). Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 333, 338, and 342 (☿, ♀, ♂). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿); 1884, Ann. Mus. Civ. Genova, XXI, p. 539 (☿). Reuter, 1884, Öfvers. Finsk. Vet.-Soc. Forh., XXVI, pp. 1–21. Preudhomme, 1885, Ann. Soc. Ent. Belgique, XXIX, C. R., p. cxxxvii. Korlevic, 1886, Rovart. Lapok, III, pp. 18 and iv. Fromholz, 1886, Ent. Nachr., XII, p. 122. Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 359. Provancher, 1887, 'Addit. Faune Ent. Canada, Hym.,' p. 249. Bellevoye, 1888, Ann. Soc. Ent. France, (6) VIII, Bull., p. clxxvii. Riley, 1888, 'Insect Life,' II, p. 106, fig. 18. Bellevoye, 1890, ibid., II, pp. 230–233. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 69. Mayr, 1893. Jahrb. Hamburg. Wiss. Anst., X, 2, p. 201; 1895, Ann. Naturh. Hofmus. Wien, X, p. 133. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337. Mayr, 1896, Ent. Tidskr., XVII, p. 238. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 40. Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p.

81 (♀). Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 29. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 12; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Emery, 1908, Deutsch. Ent. Zeitschr., p. 684 (☿, ♀, ♂). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 145 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 351 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿, ♀). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 245 (☿, ♀). Arnold, 1916, Ann. South African Mus., XIV, p. 228 (☿, ♀, ♂). Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 147. Santschi, 1920, 'Études Maladies Parasites Cacaoyer, S. Thomé,' X, p. 2. See pp. 162 and 1027.

Formica pharaonis Linnæus, 1758, 'Syst. Nat.,' Ed. 10, I, p. 580; 1764, 'Mus. Ludov. Ulric.,' p. 418; 1767, 'Syst. Nat.,' Ed. 12, I, 2, p. 963. P. L. Müller, in Linnæus, 1775, 'Vollst. Natursyst.,' V, p. 913. Gmelin, in Linnæus, 1790, 'Syst. Nat.,' Ed. 13, I, 5, p. 2799. Christ, 1791, 'Naturg. d. Insect.,' p. 514. Olivier, 1791, 'Encycl. Méthod. Insect.,' VI, p. 503. Latreille, 1802, 'Hist. Nat. Fourmis,' p. 290.

Formica antiguensis Fabricius, 1793, 'Ent. Syst.,' II, p. 357. Latreille, 1802, 'Hist. Nat. Fourmis,' p. 285. Fabricius, 1804, 'Syst. Piez.,' p. 404.

Myrmica domestica Shuckard, 1838, Mag. Nat. Hist., (2) II, p. 627 (☿, ♀). F. Smith, 1851, 'List Brit. Anim. Brit. Mus.,' VI, Aculeat., p. 119 (♀, ♂). Daniell, 1852, Proc. Linn. Soc. London, II, pp. 172-177. Wakefield, 1853, Zoologist, XI, p. 3810. Daniell, 1853, ibid., XI, pp. 3769-3773. Curtis, 1854, Trans. Linn. Soc. London, XXI, p. 217. F. Smith, 1855, Trans. Ent. Soc. London, (2) III, p. 130 (☿, ♀, ♂); 1859, Zoologist, XVII, p. 6387. Sharp, 1869, Entomologist, IV, p. 232. Gillam, 1870, ibid., V, p. 83.

Myrmica unifasciata Bostock, 1839, Trans. Ent. Soc. London, II, Proc., pp. li–lii.

Atta minuta Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 105; 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 47 (☿, ♀).

Myrmica (Œcophthora) domestica Nylander, 1856, Ann. Sc. Nat. Zool., (4) V, p. 98 (☿, ♀, ♂), Pl. III, figs. 53, 54.

Myrmica (Diplorhoptrum) molesta F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 122 (*nec* Say); 1858, 'Cat. Brit. Fossor. Hym.,' p. 34 (☿, ♀, ♂); 1858, Trans. Ent. Soc. London, (2) IV, p. 284.

Myrmica (Monomarium) fragilis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 124 (☿).

Myrmica (Monomarium) contigua F. Smith, ibid., p. 125 (♀).

Myrmica (Monomarium) molesta F. Smith, ibid., p. 130 (*nec* Say).

Diplorhoptrum fugax Lucas, 1858, Ann. Soc. Ent. France, (3) VI, Bull., p. lxxxi (*nec* Mayr, *nec auct.*).

Myrmica molesta Meinert, 1860, Danske Vidensk. Selsk. Skrift., naturv. math. Afd., (5) V, p. 335 (☿, ♀, ♂) (*nec* Say). F. Smith, 1860, Journ. Proc. Linn. Soc. London, Zool., IV, Suppl., p. 73 (*nec* Say); 1862, Trans. Ent. Soc. London, (3) I, p. 33 (*nec* Say); 1863, Ent. Annual for 1863, p. 59 (*nec* Say). Riley, 1870, Second Ann. Rep. Ins. Missouri, p. 11 (*nec* Say); 1877, Ninth Ann. Rep. Ins. Missouri, p. 43 (*nec* Say). Provancher, 1881, Natural. Canadien, XII, p. 360 (☿, ♀, ♂) (*nec* Say); 1883, 'Faune Ent. Canada, Hym.,' p. 603 (☿, ♀, ♂) (*nec* Say).

Myrmica pharaonis Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 294 (♀, ♂).

Diplorhoptrum domesticum Gaskell, 1877, Ent. Monthly Mag., XIII, p. 254. White, 1883, 'Ants and Their Ways,' p. 268, fig. 18.

Type locality: Egypt.

Cosmopolitan. Senegambia: Dakar (F. Silvestri). Liberia: Junk River. Togo: Bismarckburg (Conradt). San Thomé: (de Seabra). Cameroon: (Sjöstedt); Moliwe Region (v. Maltzahn); Duala (v. Rothkirch). Belgian Congo: Boma (Styczinski); Stanleyville; Thysville (Lang and Chapin); Sankuru (Luja). Cape Province: Cape Town (R. Lightfoot). Natal: Durban (Marley). German East Africa: Tanga (Sjostedt). Zanzibar: (Stuhlmann). Uganda: Gondokoro (F. Werner). Eritrea: Massaua (Beccari). Obock: (C. Alluaud).

23. **Monomorium rhopalocerum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 25 (☿), Pl. II, fig. 29. Santschi, 1910, ibid., LXXVIII, (1909), p. 359, fig. 4a (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 215 (☿).

Type locality: Cape Town, Cape Province (E. Simon).

23_1. Var. **gabrielense** Forel, 1916, Rev. Suisse Zool., XXIV, p. 418 (☿, ♀).

Type locality: St. Gabriel, Belgian Congo (Kohl).

23a. Subsp. **speluncarum** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 72, fig. 6 (☿). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 366.

Type locality: Shimoni, British East Africa (Alluaud and Jeannel).

24. **Monomorium schultzei** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 18 (☿, ♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 244 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 231 (☿, ♀).

Type locality: Steinkopf, Cape Province (L. Schultze).

Cape Province: Lower Albany; Grahamstown (Hewitt). German Southwest Africa: Prince of Wales Bay, south of Angra Pepueña (L. Schultze).

25. **Monomorium voeltzkowi** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 78 (☿).

Type locality: Chake Chake, Pemba Island, British East Africa (Voeltzkow).

26. **Monomorium zulu** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 18 (☿). Trägårdh, ibid., p. 44. Arnold, 1916, Ann. South African Mus., XIV, p. 215 (☿).

Type locality: Junction of the Umfolosi Rivers, Zululand (I. Trägårdh).

Subgenus 2. **Syllophopsis** Santschi

Monomorium subg. *Syllophopsis* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 259.

Subgenotype: *Monomorium modestum* Santschi, 1915.

27. **Monomorium (Syllophopsis) modestum** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 250, fig. 8 (☿).

Monomorium modestum Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 17 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 214 (☿).

Type locality: Stamford Hill, Natal (I. Trägårdh).

27_1. Var. **smutsi**, new name.

Monomorium (Syllophopsis) modestum var. *boerorum* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 260, fig. 9 (☿) (*nec M. minutum* subsp. *boerorum* Forel, 1910).

Type locality: Pretoria, Transvaal.

Subgenus 3. **Xeromyrmex** Emery

Monomorium subg. *Xeromyrmex* Emery, 1915, Bull. Soc. Ent. France, pp. 190 and 191.

Subgenotype: *Formica salomonis* Linnæus, 1758.

28. **Monomorium (Xeromyrmex) afrum** Ern. André.

Monomorium afrum Ern. André, in Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 540 (☿); in Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 65. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 136 (☿). Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, p. 198. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 72 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 206 (☿), Pl. v, figs. 58, 58*a*, 58*b*, 58*c*.

Type locality: Atbara River, Anglo-Egyptian Sudan (Magretti).

Rhodesia: Bulawayo (G. Arnold). British East Africa: Tiwi; Samburu, Wa-Nyika (Alluaud and Jeannel).

28_1. Var. **asmarense** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 250 (☿, ♂). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Type locality: Asmara, Eritrea (K. Escherich).

Eritrea: Ghinda (K. Escherich); Nefasit (F. Silvestri; K. Escherich).

28_2. Var. **fultor** Forel, 1913, Rev. Zool. Afr., II, p. 332 (☿). Bequaert, ibid., p. 427. See p. 163.

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Belgian Congo: Niapu; Garamba (Lang and Chapin).

29. **Monomorium (Xeromyrmex) albopilosum** Emery.

Monomorium albopilosum Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 24 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 17 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 207 (☿).

Type locality: Bloemfontein, Transvaal (E. Simon).

Cape Province: Kimberley (E. Simon). Transvaal: Makapan (E. Simon). Zululand: Umfolosi (I. Trägårdh). Basutoland: Leribe (Weitzecker).

29_1. Var. **clarithorax** Santschi, 1919, Rev. Zool. Afr., VI, p. 235.

Type locality: Natal (Haviland).

29_2. Var. **thales** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 136 (☿); 1916, Rev. Suisse Zool., XXIV, p. 417 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 207 (☿, ♀, ♂), Pl. v, fig. 61.

Type locality: Springvale, Rhodesia (G. Arnold).

Rhodesia: Matoppo Hills; Bulawayo (G. Arnold). Transvaal: Shilouvane (Junod); Pretoria (Lounsbury).

29a. Subsp. **paucipilosum** Santschi, 1919, Rev. Zool. Afr., VI, p. 235 (☿).

Type locality: Natal (Haviland).

30. **Monomorium (Xeromyrmex) bicolor** Emery. See p. 162.

Monomorium bicolor Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 368 (☿); 1881, ibid., XVI, pp. 531 and 532 (☿). Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, p. 334 (☿). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿); 1884, Ann. Mus. Civ. Genova, XXI, p. 540 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 66. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 88; 1901, ibid., X, p. 311. Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 7 (☿, ♀). Forel, in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; 1907, Ann. Mus. Nat. Hungarici, V, p. 18 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (☿). Emery, 1908, Deutsch. Ent. Zeitschr., p. 677 (☿). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 251 (☿, ♀). Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 163; 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 353 (☿). Emery, 1915, ibid., X, p 4 (☿).

Monomorium bicolor var. *cærulescens* Santschi, 1912, Bull. Soc. Hist. Nat. Afr. Nord, IV, p. 148 (☿).

Type locality: Sciotel, Eritrea (Beccari).

Senegambia: Dakar (F. Silvestri). Portuguese Guinea: Bissao (Knipping). French Guinea: Kindia; Mamou (F. Silvestri). Ivory Coast: (Lohier). Belgian Congo: Leopoldville; Garamba (Lang and Chapin). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). Orange Free State: Bothaville (H. Brauns). German East Africa: Mto-ya-Kifaru (Katona). Southern Abyssinia: (Ilg). Eritrea: Nefasit (F. Silvestri; K. Escherich); Ghinda (K. Escherich). Anglo-Egyptian Sudan: Suakin; Metemma (Magretti). French Somaliland: Obock (Maindron).

30*a*. Subsp. **dakarense** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 353 (☿).

Type locality: Dakar, Senegambia (F. Silvestri).

Senegambia: Longa (Roubaud).

30*b*. Subsp. **hirsutum** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 251 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 353 (☿).

Type locality: Nefasit, Eritrea (K. Escherich).

Somaliland.

30*c*. Subsp. **nitidiventre** Emery, 1893, Ann. Soc. Ent. France, LXII, p. 256 (☿). Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 4. Emery, 1908, Deutsch. Ent. Zeitschr., p. 677, fig. 5 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 5, figs. 1 and 2 (☿, ♀, ♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 353 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 244 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 209 (☿, ♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ, p. 73 (☿). A. J. Chalmers, 1919, Journ. Trop. Med. Hyg., London, XXII, p. 117.

Monomorium bicolor var. *nitidiventris* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 441 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 209 (☿, ♀).

Type locality: Aden, Southern Arabia (E. Simon).

Egypt: Lower Egypt; Assuan (I. Trägårdh). Anglo-Egyptian Sudan: Khartum (Karawaiew). British East Africa: Naivasha, Rift Valley, 1900 m. (Alluaud and Jeannel). Rhodesia: Victoria Falls (R. C. Wroughton); Bulawayo (G. Arnold). Orange Free State: Bothaville (H. Brauns).

31. **Monomorium (Xeromyrmex) hannonis** Santschi.

Monomorium hannonis Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 358 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

32. **Monomorium (Xeromyrmex) medinæ** Forel.

Monomorium medinæ Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 454 (☿). Emery, 1908, Deutsch. Ent. Zeitschr., p. 679, fig. 9 (☿).

Type locality: Laguna, Canary Islands (Medina).

32a. Subsp. **fridæ** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 183 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 219 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

33. **Monomorium (Xeromyrmex) salomonis** (Linnæus) Emery, 1915, Bull. Soc. Ent. France, p. 190. See p. 1027.

Formica salomonis Linnæus, 1758, 'Syst. Nat.,' Ed. 10, I, p. 580.

Monomorium salomonis Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 336, 339 and 342 (☿, ♀, ♂), Pl. xxii, figs. 1–4. Mayr, in Jägerskiold, 1903, 'Exped., IX, Formicid.,' p. 4. Emery, 1908, Deutsch. Ent. Zeitschr., p. 674 (☿, ♀, ♂).

Monomorium salamonis Arnold, 1916, Ann. South African Mus., XIV, p. 219 (☿, ♀, ♂).

Type locality: Egypt.

Cosmopolitan. Anglo-Egyptian Sudan: Ondurman; Wadi Halfa (I. Trägårdh).

33_1. Var. **parvinode** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 88 (☿).

Type locality: Southern Abyssinia (Ilg).

33_2. Var. **pullulum** Santschi, 1919, Rev. Zool. Afr., VI, p. 235 (☿).

Type locality: Senegal, Senegambia (Claveau).

33a. Subsp. **carbo** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 246 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Monomorium salomonis var. *carbo* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 251 (☿).

Type locality: Ghinda, Eritrea (K. Escherich).

Eritrea: Nefasit (F. Silvestri).

33*b*. Subsp. **damarense** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 17 (☿).

Monomorium salamonis subsp. *damarense* Arnold, 1916, Ann. South African Mus., XIV, p. 223 (☿).

Type locality: Gawieb, German Southwest Africa (L. Schultze).

33*c*. Subsp. **delagoense** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 87 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 441 (☿, ♀, ♂). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 17 (☿). Trägardh, ibid., p. 44.

Monomorium salamonis subsp. *delagoensis* Arnold, 1916, Ann. South African Mus., XIV, p. 226 (☿, ♀, ♂).

Type locality: Delagoa Bay, Portuguese East Africa (Liengme).

Natal: (Haviland); Estcourt; Pietermaritzburg (I. Trägårdh). Zululand: Dukudu; Umfolosi (I. Trägårdh).

$33c_1$. Var. **grahamstownense** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 245 (☿).

Monomorium salamonis subsp. *delagoense* var. *grahamstownensis* Arnold, 1916, Ann. South African Mus., XIV, p. 227 (☿).

Type locality: Grahamstown, Cape Province (G. Arnold).

33*d*. Subsp. **herero** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 16 (☿, ♀). Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 284.

Monomorium salamonis subsp. *herero* Arnold, 1916, Ann. South African Mus., XIV, p. 222 (☿, ♀).

Type locality: Possession Island, German Southwest Africa (L. Schultze).

33*d*₁. Var. **belli** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 245 (☿).

Monomorium salamonis subsp. *herero* var. *belli* Arnold, 1916, Ann. South African Mus., XIV, p. 223 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

33*d*₂. Var. **willowmorense** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 245 (☿).

Monomorium salamonis subsp. *herero* var. *willowmorensis* Arnold, 1916, Ann. South African Mus., XIV, p. 222 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

33*e*. Subsp. **junodi** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 441 (☿); 1913, ibid., LVII, p. 137 (☿).

Monomorium salamonis subsp. *junodi* Arnold, 1916, Ann. South African Mus., XIV, p. 221 (☿).

Type locality: Shilouvane, Transvaal (Junod).

Rhodesia: Bulawayo (G. Arnold).

33*e*₁. Var. **opacius** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 136 (☿). Santschi, 1919, Rev. Zool. Afr., VI, p. 235.

Monomorium salamonis var. *opacior* Arnold, 1916, Ann. South African Mus., XIV, p. 220 (☿, ♀).

Type locality: Bulawayo, Rhodesia (G. Arnold).

33*f*. Subsp. **ocellatum** Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 377 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

33*g*. Subsp. **subopacum** (F. Smith) Emery, 1908, Deutsch. Ent. Zeitschr., p. 676, fig. 4 (☿, ♀). Wasmann, 1912, Zeitschr. Wiss. Zool., CI, p. 107.

Myrmica (Monomarium) subopaca F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 127 (☿, ♀).

Monomorium mediterraneum Mayr, 1861, 'Europ. Formicid.,' p. 72 (☿, ♀). Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 294.

Monomorium subopacum subsp. *mediterraneum* Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 531 (♀).

Monomorium subopacum var. *mediterraneum* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 133.

Monomorium subopacum Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 753 (☿); 1863, ibid., XIII, p. 429. Ern. André, 1874, Rev. Mag. Zool., (3) II, p. 199. Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 531 (☿); 1892, ibid., XXXII, p. 117. Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 336 and 339 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 70.

Monomorium salomonis var. *subopacum* Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 18 (☿). Santschi, 1908, Ann. Soc. Ent. France, LXXVII, p. 517 (☿, ♀); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 353 (☿).

Monomorium salamonis subsp. *subopacum* Arnold, 1916, Ann. South African Mus., XIV, p. 224 (☿, ♀).

Type locality: Madeira (T. V. Wollaston).

Canaries, Morocco, southern Spain, Sardinia, Sicily, Naxos, Algiers, Egypt. Cape Province: Cape Town (Raffray); Willowmore (H. Brauns). Rhodesia: Bulawayo (G. Arnold). Somaliland: Obbia; Gubbet (Bricchetti-Robecchi). Gold Coast: Kitta (H. Brauns).

33*g*₁. Var. **anceps** (Emery).

Monomorium subopacum var. *anceps* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 24 (☿).

Monomorium salamonis subsp. *subopacum* var. *anceps* Arnold, 1916, Ann. South African Mus., XIV, p. 225 (☿).

Type locality: Hamman's Kraal, Transvaal (E. Simon).

33*g*₂. Var. **santschiellum,** new name.

Monomorium salomonis subsp. *subopacum* var. *senegalense* Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 306 (☿) (*nec Monomorium senegalense* Roger, 1862).

Type locality: St. Louis, Senegambia (Claveau).

33*h*. Subsp. **termitarium** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 17 (☿, ♀); 1910, Ann. Soc. Ent. Belgique, LIV, p. 441.

Monomorium salamonis subsp. *termitarium* Arnold, 1916, Ann. South African Mus., XIV, p. 224 (☿, ♀).

Type locality: Kooa, Bechuanaland (L. Schultze).

Mossamedes: (Baum and Van der Kellen).

33*h*₁. Var. **disertum** Forel, 1916, Rev. Suisse Zool., XXIV, p. 417.

Monomorium salomonis var. *diserta* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 216 (☿).

Monomorium salamonis var. *diserta* Arnold, 1916, Ann. South African Mus., XIV, p. 221 (☿).

Type locality: Shiloh, Southern Rhodesia (G. Arnold).

34. **Monomorium (Xeromyrmex) senegalense** Roger.

Monomorium senegalense Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 294, footnote (☿); 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 429. Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 530 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 70.

Type locality: Senegal, Senegambia.

35. **Monomorium (Xeromyrmex) setuliferum** Forel.

Monomorium setuliferum Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 16 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 227 (☿).

Type locality: Khakhea, Bechuanaland (L. Schultze).

Angola: Quifangondo (F. Silvestri). German Southwest Africa: Okahandja (Casper). Bechuanaland: Severelela (L. Schultze).

35₁. Var. **notulum** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 441 (☿, ♂); 1913, ibid., LVII, p. 137 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 228 (☿, ♂).

Type locality: Natal (Haviland).

Southern Rhodesia: Bulawayo; Springvale (G. Arnold).

36. **Monomorium (Xeromyrmex) subdentatum** Forel.

Monomorium subdentatum Forel, 1913, Rev. Zool. Afr., II, p. 332 (☿). Bequaert, ibid., p. 427.

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

37. **Monomorium (Xeromyrmex) tchelichofi** Forel.

Monomorium tchelichofi Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 244 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 211 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

38. **Monomorium (Xeromyrmex) venustum** (F. Smith).

Myrmica (Monomarium) venusta F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 126 (☿).

Monomorium venustum Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 531 (☿). Ern. André, 1881, Ann. Soc. Ent. France, (6) I, p. 65 (☿, ♀, ♂), Pl. iii, figs. 16–18; 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 335, 339, and 343 (☿, ♀, ♂), Pl. xxii, figs. 6 and 7. Dalla Torre, 1893 'Cat. Hym.,' VII, p. 70. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 88. Emery, 1908, Deutsch. Ent. Zeitschr., p. 677, fig. fig. 6*b* (☿, ♀).

Type locality: Syria.

Southern Abyssinia: (Ilg).

Subgenus 4. **Parholcomyrmex** Emery

Monomorium subg. *Parholcomyrmex* Emery, 1915, Bull. Soc. Ent. France, p. 190.

Monomorium subg. *Paraholcomyrmex* Emery, ibid., p. 191.

Subgenotype: *Myrmica gracillima* F. Smith, 1861.

39. **Monomorium (Parholcomyrmex?) amblyops** Emery.

Monomorium amblyops Emery, 1894, Bull. Soc. Ent. Italiana, XXVI, p. 148.

Type locality: Matto Grosso, Brazil.

39a. Subsp. **prossæ** Forel, 1916, Rev. Suisse Zool., XXIV, p. 418.

Monomorium amblyops subsp. *bulawayense* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 247 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 236 (☿, ♀, ♂). (*nec Monomorium exiguum* var. *bulawayense* Forel, 1913).

Type locality: Hillside, Bulawayo, Rhodesia (G. Arnold).

40. **Monomorium (Parholcomyrmex) australe** (Emery).

Monomorium subopacum subsp. *australe* Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 363 (☿, ♀).

Monomorium australe Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 65.

Monomorium subopacum subsp. *australe* var. *laviceps* Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 364 (☿).

Monomorium salomonis subsp. *australe* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 216 (☿, ♀).

Monomorium salamonis subsp. *australe* Arnold, 1916, Ann. South African Mus., XIV, p. 225 (☿, ♀).

Monomorium subopacum var. *australe* Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 339.

Monomorium (Paraholcomyrmex) australe Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 282 (☿, ♀).

Type locality: Cape of Good Hope, Cape Province (L. Péringuey).

Cape Province: Willowmore (H. Brauns); Kimberley (Dixey and Longstaff).

40a. Subsp **havilandi** (Forel) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 282 (☿, ♀).

Monomorium havilandi Forel, 1910, Ann. Soc. Ent Belgique, LIV, p. 443 (☿, ♀). Arnold, 1916, Ann South African Mus., XIV, p. 216 (☿, ♀).

Type locality: Natal (Haviland).

Cape Province: Cape of Good Hope (L. Péringuey; G. Arnold).

41. **Monomorium (Parholcomyrmex) destructor** (Jerdon).

Atta destructor Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 105; 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 47 (☿).

Myrmica vastator F. Smith, 1858, Journ. Proc. Linn. Soc. London, Zool., II, p. 71 (☿).

Myrmica ominosa Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 (☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 517 (☿).

Myrmica atomaria Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 (♀); in Peters, 1862. 'Reise n. Mossambique, Zool.,' V, p. 518 (♀).

Myrmica (Monomarium) vastator F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 123 (☿).

Myrmica (Monomarium) basalis F. Smith, ibid., p. 125 (☿).

Monomorium ominosum Roger, 1863, 'Verzeich. Formicid.,' p. 31. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 429.

Monomorium atomarium Mayr, 1863, ibid., XIII, p. 429.

Monomorium basale Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 92 (☿). Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 369, fig. (☿, ♀); 1881, ibid., XVI, p. 532 (☿). Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 359 (☿).

Monomorium vastator Mayr, ibid., p. 359. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿).

Monomorium destructor Emery, in Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 66. Santschi, 1908, Ann. Soc. Ent. France, LXXVII, p. 517 (☿). Emery, 1908, Deutsch. Ent. Zeitschr., p. 671 (☿, ♀).

Type locality: India (Jerdon).

Tropicopolitan. Eritrea: Sciotel (Beccari). Zanzibar: (Voeltzkow). Portuguese East Africa: Quilimane (Peters).

41a. Subsp. **kalahariense** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 18 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 235 (☿).

Type locality: Kooa to Sekgoma, Bechuanaland (L. Schultze).

41a$_1$. Var. **despectum** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 252 (☿); 1913, Rev. Zool. Afr., II, p. 331 (☿, ♀). Bequaert, ibid., p. 427.

Type locality: Ghinda, Eritrea (K. Escherich).

Belgian Congo: Sankisia (J. Bequaert).

42. **Monomorium (Parholcomyrmex) dispar** Emery.

Monomorium dispar Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 24 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 235 (☿).

Type locality: Makapan, Transvaal (E. Simon).

43. **Monomorium (Parholcomyrmex) gracillimum** (F. Smith) Emery, 1915, Bull. Soc. Ent. France, p. 190. See p. 1027.

Myrmica gracillima F. Smith, 1862, Journ. Proc. Linn. Soc. London, Zool., VI, p. 34 (☿).

Monomorium gracillimum Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 753 (☿); 1863, ibid., XIII, p. 429. Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 369, footnote, fig. (☿, ♀, ♂); 1881, ibid., XVI, pp. 532 and 533 (☿). Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 333, 337, and 340 (☿, ♀, ♂), Pl. xxii, figs. 8 and 9. Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 541 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 67. FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 88; 1902, Ann. Soc. Ent. Belgique, XLVI, p. 152 (☿). EMERY, 1908, Deutsch. Ent. Zeitschr., p. 669, fig. 2 (☿, ♀, ♂).

Monomorium (Holcomyrmex) gracillimum SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿).

Type locality: SYRIA.

SYRIA, TUNIS, southern ALGERIA, central ASIA, ARABIA, INDIA, JAVA, LAYSAN, etc. FRENCH GUINEA: Mamou (F. Silvestri). ANGLO-EGYPTIAN SUDAN: Kassala; El Hefera, Settit (Magretti). SOUTHERN ABYSSINIA: (Ilg).

43_1. Var. **karawajewi** (FOREL).

Monomorium destructor subsp. *gracillimum* var. *karawajewi* FOREL, 1913, Rev. Suisse Zool., XXI, p. 437 (☿).

Monomorium minutum var. *pallidipes* KARAWAIEW, 1911, Rev. Russe Ent., XI, p. 7 (☿) (*nec* Forel).

Type locality: Khartum, ANGLO-EGYPTIAN SUDAN (Karawaiew).

SYRIA: Rehobot near Jaffa (Aharoni).

43a. Subsp. **robustius** FOREL, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿); 1894, ibid., IX, p. 88. MAYR, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 12. See pp. 163 and 1027.

Monomorium robustius DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 69.

Monomorium destructor subsp. *robustius* FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 216 (☿).

Type locality: SOMALILAND (C. Keller).

SOUTHERN ABYSSINIA: (Ilg). BELGIAN CONGO: Yakuluku (Lang and Chapin). GERMAN EAST AFRICA: Mt. Meru (Sjöstedt).

Subgenus 5. **Holcomyrmex** MAYR

Holcomyrmex MAYR, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 671.

Aphaenogaster (part) ERN. ANDRÉ. *Atta* (part) ROGER.

Monomorium subg. *Holcomyrmex* EMERY, 1915, Bull. Soc. Ent. France, p. 191.

Subgenotype: *Holcomyrmex scabriceps* Mayr, 1878.

44. **Monomorium (Holcomyrmex) abyssinicum** FOREL, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 250 (☿). SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 259 (☿).

Holcomyrmex abyssinicus FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 83 (☿).

Type locality: SOUTHERN ABYSSINIA (Ilg).

ERITREA: Ghinda (K. Escherich). DAHOMEY: (Desanti).

Subgenus 6. **Lampromyrmex** MAYR

Lampromyrmex MAYR, 1868, Beiträge z. Naturkunde Preussens, I, p. 93.

Monomorium subg. *Mitara* EMERY, 1913, Ann. Soc. Ent. Belgique, LVII, p. 261 (type: *Monomorium laeve* Mayr, 1879).

Subgenotype: *Lampromyrmex gracillimus* Mayr, 1868 = *Monomorium mayrianum* Wheeler, 1914, from the Baltic amber.

45. **Monomorium (Lampromyrmex) bequaerti** FOREL.

Monomorium (Martia) bequaerti FOREL, 1913, Rev. Zool. Afr., II, p. 334 (☿). BEQUAERT, ibid., p. 428.

Type locality: Elisabethville, BELGIAN CONGO (J. Bequaert).

46. **Monomorium (Lampromyrmex) exiguum** Forel.

Monomorium exiguum Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 85 (☿).

Monomorium (Martia) exiguum Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 351 (☿).

Type locality: Southern Abyssinia (Ilg).

Belgian Congo: Leopoldville (J. Maes).

46_1. Var. **bulawayense** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 217 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 238 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

46*a*. Subsp. **flavescens** Forel, 1916, Rev. Suisse Zool., XXIV, p. 418 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

46*b*. Subsp. **mictile** (Forel) Emery, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 4 (☿, ♀).

Monomorium (Martia) atomus subsp. *mictilis* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 252 (☿, ♀).

Monomorium (Mitara) atomus subsp. *mictile* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 248. Arnold, 1916, Ann. South African Mus., XIV, p. 239 (☿, ♀).

Type locality: Ghinda, Eritrea (K. Escherich; F. Silvestri).

Eritrea: Nefasit (K. Escherich). Natal: Durban (G. Arnold; C. B. Cooper).

47. **Monomorium (Lampromyrmex) faurei** Santschi.

Monomorium (Mitara) atomus subsp. *mictile* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿) (*nec* Forel).

Monomorium (Mitara) faurei Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 260, fig. 10 (☿).

Type locality: Gaboon, French Congo (F. Faure).

French Guinea: Mamou (F. Silvestri).

48. **Monomorium (Lampromyrmex) orientale** Mayr.

Monomorium orientale Mayr, 1878, Verh. Zool. Bot. Ges. Wien, XXVIII, p. 670 (☿). Emery, 1908, Deutsch. Ent. Zeitschr., p. 685 (☿, ♀).

Monomorium (Mitara) orientale Santschi, 1915, Bull. Soc. Hist. Nat. Afr. Nord, VII, p. 58, fig. 5 (☿).

Type locality: Calcutta, India (Rothney).

48_1. Var. **africanum** "Mayr" Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 78 (♀). This has apparently not been described.

Type locality: unknown.

British East Africa: Fundu Island near Pemba (Voeltzkow).

48_2. Var. **clavicorne** (Ern. André) Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 4. Emery, 1908, Deutsch. Ent. Zeitschr., p. 686.

Monomorium clavicorne Ern. André, 1881, Ann. Soc. Ent. France, LI, p. 68 (☿), Pl. iii, fig. 9; 1883, 'Spec. Hym. Europ. Algérie,' II, p. 332 (☿), Pl. xxii, fig. 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 66.

Type locality: Syria.

Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh).

49. **Monomorium (Lampromyrmex) rosæ** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 13, fig. 2*c–f* (☿).

Type locality: Belgian Congo (J. Bequaert); no further locality is given, but the collector's field-number (No. 36) refers to Boma, according to verbal information received from Dr. Bequaert.

50. **Monomorium (Lampromyrmex) rotundatum** SANTSCHI, 1920, Ann. Soc. Ent. Belgique, LX, p. 14, fig. 2a (☿).

Type locality: Durban, NATAL (Marley).

Diplomorium MAYR

Diplomorium MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 16.

Genotype: *Diplomorium longipenne* Mayr, 1901.

1. **Diplomorium longipenne** MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 18 (☿, ♀). ARNOLD, 1916, Ann. South African Mus., XIV, p. 240 (☿, ♀).

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

Bondroitia FOREL

Diplomorium subg. *Bondroitia* FOREL, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 398.

Bondroitia FOREL, 1915, 'Fauna Ins. Helvetiæ, Hym., Formicidæ,' pp. 10 and 38.

Genotype: *Diplomorium (Bondroitia) lujæ* Forel, 1909.

1. **Bondroitia lujæ** (FOREL).

Diplomorium lujæ FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 72 (☿, ♀, ♂).

Diplomorium (Bondroitia) lujæ FOREL, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 398 (☿, ♀, ♂).

Type locality: Sankuru, BELGIAN CONGO (Luja).

Solenopsis WESTWOOD

Solenopsis WESTWOOD, 1840, Ann. Mag. Nat. Hist., VI, p. 86.

Diplorhoptrum MAYR, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 449.

Atta (part) FABRICIUS, JERDON, F. SMITH, etc. *Crematogaster* (part) F. SMITH. *Formica* LATREILLE, etc. *Myrmica* LATREILLE, etc.

Genotype: *Solenopsis mandibularis* Westwood, 1840.

1. **Solenopsis africana** (SANTSCHI) EMERY, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 59, fig. 1 (☿).

Solenopsis fugax subsp. *africana* SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 81 (☿, ♂).

Type locality: Blue Post Hotel, Kikuyu, 1550 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

2. **Solenopsis capensis** MAYR, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 905 (♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 75.

Type locality: Cape of Good Hope.

3. **Solenopsis geminata** (FABRICIUS) ROGER, 1863, 'Verzeich. Formicid.,' pp. 32 and 49. MAYR, 1867, Tijdschr. v. Ent., X, p. 109 (☿, ♀, ♂); 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 996 (☿). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 359; 1913, Ann. Soc. Ent. Belgique, LVII, p. 306 (♃, ☿, ♀).

Atta geminata FABRICIUS, 1804, 'Syst. Piez.,' p. 423 (♀).

Solenopsis geminata var. *innota* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 257, fig. 6 (♃, ☿, ♀, ♂).

Type locality: South America.

Tropicopolitan. LIBERIA: Monrovia (Delafosse). FRENCH CONGO: Sarakita (F. Faure); Brazzaville (Valerio). BELGIAN CONGO: Goma (Valerio).

4. **Solenopsis gnomula** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 13, fig. 6 (☿).

Type locality: Nefasit, Eritrea (F. Silvestri).

5. **Solenopsis maligna** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 359, fig. 5 (☿). Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 64, fig. 6 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

6. **Solenopsis orbuloides** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 321 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 77. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 354 (☿, ♀). Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 59.

Type locality: Sierra Leone (Mocquerys).

Nigeria: Olokemeji; Lagos (F. Silvestri).

7. **Solenopsis punctaticeps** Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 109 (☿); 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 996 (☿); 1887, ibid., XXXVII, p. 616 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 77. Wasmann, 1899, Deutsch. Ent. Zeitschr., p. 405. Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 14 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 430; 1911, Rev. Zool. Afr., I, p. 276 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 138 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 355 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 19, figs. 1, *2* (☿, ♀). Trägårdh, ibid., p. 44. Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, pp. 60 *et seq.*, fig. 2 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 243 (☿, ♀, ♂), Pl. vi, figs. 78, 78a, 78*b*.

Solenopsis punctatoceps J Hewitt, 1920, South African Journ. Nat. Hist., II, p. 109.

Type locality: Table Mountain, Cape of Good Hope (Novara Expedition).

Rhodesia: (G. Arnold). Natal: Pietermaritzburg; Balgowan (I. Trägårdh); Estcourt (R. C. Wroughton); Shivyre (Haviland). Orange Free State: Bothaville (H. Brauns). Cape Province: Port Elizabeth (H. Brauns); St. Croix Island, Algoa Bay (Hewitt). Angola: Quifangondo (F. Silvestri). Belgian Congo: Congo da Lemba (R. Mayné).

7_1. Var. **cleptomana** (Santschi) Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 65, fig. 7 (☿).

Solenopsis cleptomana Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 80 (☿).

Type locality: Naivasha, Rift Valley, 1400 m., British East Africa (Alluaud and Jeannel).

7a. Subsp. **caffra** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 16. Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 62, fig. 3, I and II (☿).

Solenopsis punctaticeps var. *caffra* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 99 (☿, ♀). Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 27. Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 15 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 431 (♀); 1913, Rev. Zool. Afr., II, p. 337 (☿). Bequaert, ibid., p. 429. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 242 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 246 (☿, ♀).

Type locality: Transvaal (P. Berthoud).

Belgian Congo: Elisabethville (J. Bequaert). Bechuanaland: Kooa (L. Schultze). Transvaal: Pretoria (E. Simon). Natal: (R. C. Wroughton). Cape Province: Table Mt. (G. Arnold). Portuguese East Africa: Delagoa Bay: (Liengme).

$7a_1$. Var. **cyclops** (Santschi).

Solenopsis punctaticeps subsp. *cyclops* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 19, fig. 1, *1* (☿, ♂).

Solenopsis punctaticeps subsp. *caffra* var. (?) *cyclops* Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 62, fig. 3, III (☿).

Solenopsis punctaticeps var. *cyclops* Arnold, 1916, Ann. South African Mus., XIV, p. 246 (☿, ♂).

Type locality: Natal (I. Trägårdh).

Natal: Durban (Marley; C. B. Cooper).

$7a_2$. Var. **diversipilosa** (Mayr).

Solenopsis punctaticeps var. *diversipilosa* Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 15 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 247 (☿).

Solenopsis punctaticeps subsp. *caffra* var. (?) *diversipilosa* Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, pp. 62, 65.

Type locality: Port Elizabeth, Cape Province (H. Brauns).

Cape Province: Grahamstown (Hewitt).

7*b*. Subsp. **erythræa** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 12, fig. 5 (☿); 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 64, fig. 5 (☿).

Type locality: Asmara, Eritrea (F. Silvestri).

Eritrea: Nefasit (F. Silvestri).

7*c*. Subsp. **indocilis** (Santschi) Emery, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 63, fig. 4 (☿).

Solenopsis punctaticeps var. *indocilis* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 355 (☿, ♀).

Type locality: Mamou, French Guinea (F. Silvestri).

7*d*. Subsp. **kibaliensis** Wm. M. Wheeler. See p. 164 (☿, ♂).

Type locality: Vankerckhovenville, Belgian Congo (Lang and Chapin)

8. **Solenopsis sævissima** (F. Smith) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 751 (☿).

Myrmica sævissima F. Smith, 1855, Trans. Ent. Soc. London, (2) III, p. 166 (☿), Pl. xiii, fig. 18.

Type locality: Tapajos River, Brazil (W. H. Bates).

Neotropical and apparently spreading to other continents.

8_1. Var. **itinerans** (Forel).

Solenopsis pylades var. *itinerans* Forel, 1911, Rev. Zool. Afr., I, p. 276 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 355 (☿).

Type locality: Kigerama, German East Africa.

French Guinea: Konakry (F. Silvestri).

Anergatides Wasmann

Anergatides Wasmann, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 281.
Genotype: *Anergatides kohli* Wasmann, 1915.

1. **Anergatides kohli** WASMANN, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 283 (♀, ♂), Pls. VII and VIII.

Type locality: Fikilini, near Stanleyville, BELGIAN CONGO (H. Kohl).

Pheidologeton MAYR

Pheidologeton MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 750.

Phidologeton BINGHAM, 1903, 'Fauna Brit. India, Hym.,' II, p. 160.

Myrmica (part) HEER. *Œcodoma* (part) JERDON. *Pheidole* (part) F. SMITH. *Solenopsis* (part) F. SMITH.

Genotype: *Ocodoma diversa* Jerdon, 1851 = *Pheidole ocellifera* F. Smith, 1858.

1. **Pheidologeton diversus** (JERDON) ROGER, 1863, 'Verzeich. Formicid.,' p. 30.

Ocodoma diversa JERDON, 1851, Madras Journ. Litt. Sc., XVII, p. 109 (♃ ☿); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 51 (♃ ☿).

Type locality: Wynaad, SOUTHERN INDIA (Jerdon).

Oriental Region.

1a. Subsp. **standfussi** FOREL, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 386 (♃).

Type locality: GUINEA (locality extremely doubtful).

2. **Pheidologeton solitarius** STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 141 (♀).

Type locality: Sokode Basan, TOGO (Schröder).

The generic reference of this species is perhaps erroneous.

The following species has been referred to *Pheidologeton* by Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 899; but owing to its 12-jointed antennæ it cannot belong in that genus. It is impossible to place it without examining the type specimen.

Atta hostilis F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 165 (☿, ♀).

Type locality: Port Natal, NATAL.

Aneleus EMERY

Pheidologeton subg. *Aneleus* EMERY, 1900, Termes. Füzetek, XXIII, p. 327.

Genotype: *Solenopsis similis* Mayr, 1862.

1. **Aneleus diabolus** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 355, fig. 19 (♃, ☿).

Oligomyrmex diabolus SANTSCHI, 1913, Bull. Soc. Ent. France, pp. 459 and 460 (♃, ☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

2. **Aneleus perpusillus** (EMERY) ARNOLD, 1916, Ann. South African Mus., XIV, p. 254 (♃, ☿).

Pheidologeton perpusillum EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 26 (♃, ☿), Pl. II, figs. 8–11. FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 431 (☿).

Type locality: Pretoria, TRANSVAAL (E. Simon).

CAPE PROVINCE: Kimberley (E. Simon). NATAL: in the Mountains (R. C. Wroughton).

2a. Subsp. **arnoldi** (FOREL) ARNOLD, 1916, Ann. South African Mus., XIV, p. 255 (♃, ☿), Pl. VI, figs. 81, 81a.

Phedologeton perpusillum subsp. *arnoldi* FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 242 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

2*b*. Subsp. **condecens** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 77 (♃, ☿).

Type locality: New Moschi, Mt. Kilimanjaro, 800 m., GERMAN EAST AFRICA (Alluaud and Jeannel).

BRITISH EAST AFRICA: Likoni; Cheteni (Alluaud and Jeannel).

2*c*. Subsp. **spinosus** (FOREL).

Phedologeton (*Aneleus*) *perpusillus* subsp. *spinosus* FOREL, 1907, Ann. Mus. Nat. Hungarici, V, p. 17 (♃).

Type locality: Kibosho, GERMAN EAST AFRICA (Katona).

3. **Aneleus politus** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 79, fig. 8 (☿).

Type locality: Blue Post Hotel, Kikuyu, 1520 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

4. **Aneleus silvestrii** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 357, fig. 20 (♃, ☿).

Type locality: Aburi, GOLD COAST (F. Silvestri).

Oligomyrmex MAYR

Oligomyrmex MAYR, 1867, Tijdschr. v. Ent., X, p. 110.

Genotype: *Oligomyrmex concinnus* Mayr, 1867.

1. **Oligomyrmex alluaudi** SANTSCHI, 1913, Bull. Soc. Ent. France, pp. 459 and 460 (♃, ☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 81, fig. 9 (♃, ☿).

Type locality: Shimoni, BRITISH EAST AFRICA (Alluaud and Jeannel).

BRITISH EAST AFRICA: Kijabé, Kikuyu Escarpment, 2100 m. (Alluaud and Jeannel).

1a. Var. **cataractæ** SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 337 (♃, ☿).

Type locality: Victoria Falls, RHODESIA (G. Arnold).

2. **Oligomyrmex angolensis** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 358, fig. 21 (♃, ☿).

Type locality: Quifangondo, ANGOLA (F. Silvestri).

2a Subsp. **congolensis** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 417 (♃, ☿).

Type locality: BELGIAN CONGO (H. Kohl).

3. **Oligomyrmex arnoldi** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 123 (☿). SANTSCHI, 1913, Bull. Soc. Ent. France, p. 459 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

4. **Oligomyrmex debilis** SANTSCHI, 1913, Bull. Soc. Ent. France, p. 459 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 360, fig. 22 (♃, ☿, ♂).

Oligomyrmex (*Aëromyrma?*) *debilis* SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 357 (♃, ☿).

Type locality: Kindia, FRENCH GUINEA (F. Silvestri).

FRENCH GUINEA: Konakry; Camayenne (F. Silvestri).

5. **Oligomyrmex erythræus** EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 14, fig. 7 (♃, ☿).

Type locality: Ghinda, ERITREA (F. Silvestri).

6. **Oligomyrmex jeanneli** SANTSCHI, 1913, Bull. Soc. Ent. France, pp. 459 and 460 (♃, ☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 83, fig. 10 (♃, ☿) ALLUAUD and JEANNEL, 1914, Arch. Zool. Gén. Exp., LIII, p. 366. EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 14 (☿).

Type locality: Shimoni, BRITISH EAST AFRICA (Alluaud and Jeannel).

ERITREA: Nefasit (F. Silvestri).

Aëromyrma FOREL

Aëromyrma FOREL, in Grandidier, 1891, 'Hist. Nat. Phys. Madagascar,' XX, 2, p. 198; 1891, Ann. Soc. Ent. Belgique, XXXV, C. R., p. cccvii.

Genotype: *Aëromyrma nosindambo* Forel, 1891.

1. **Aëromyrma africana** FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 15 (♃). ARNOLD, 1916, Ann. South African Mus., XIV, p. 256 (♃).

Type locality: Kooa to Sekgoma, BECHUANALAND (L. Schultze).

2. **Aëromyrma arnoldiella** (SANTSCHI).

Oligomyrmex (Aëromyrma) arnoldiella SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 340, figs. 3a, *j, p, q, v, x* (♃, ☿).

Type locality: NATAL (Haviland).

3. **Aëromyrma hewitti** (SANTSCHI).

Oligomyrmex (Aëromyrma) hewitti SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 341, figs. 3*d, l, o, t, u* (♃, ☿).

Type locality: Grahamstown, CAPE PROVINCE (Hewitt).

4. **Aëromyrma incerta** (SANTSCHI).

Oligomyrmex (Aëromyrma) incertus SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 340, figs. 3*e, h* (☿).

Type locality: Hillside, Bulawayo, RHODESIA (G. Arnold).

5. **Aëromyrma lucida** (SANTSCHI).

Oligomyrmex (Aëromyrma) lucidus SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 284 (☿); 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 339, figs. 3c and *i* (☿).

Type locality: Bunthorne Mine, Bulawayo, RHODESIA (G. Arnold).

6. **Aëromyrma nana** (SANTSCHI).

Oligomyrmex (Aëromyrma) nanus SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 338, figs. 3*f, m, r, s* (♃, ☿).

Type locality: Amatongas Forest, PORTUGUESE EAST AFRICA (G. Arnold).

7. **Aëromyrma petulca** WM. M. WHEELER. See p. 166 (♃).

Type locality: Malela, BELGIAN CONGO (Lang and Chapin).

8. **Aëromyrma semilævis** (MAYR).

Solenopsis semilævis MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 15 (☿). ARNOLD, 1916, Ann. South African Mus., XIV, p. 247 (☿).

Oligomyrmex (Aëromyrma) semilævis EMERY, 1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 59.

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

8_1. Var. **trægaordhi** (SANTSCHI).

Oligomyrmex (*Aëromyrma*) *semilævis* var. *trægaordhi* SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 285.

Aëromyrma trægaordhi SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 20, fig. 2 (☿). ARNOLD, 1916, Ann. South African Mus., XIV, p. 257 (☿).

Oligomyrmex (*Aëromyrma*) *trægaordhi* SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 338, figs. 3*e*, *g* (☿).

Type locality: Balgowan, NATAL (I. Trägårdh).

NATAL: Stamford Hill (I. Trägårdh).

9. **Aëromyrma vorax** SANTSCHI, 1913, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 145, fig. LXIX (☿); 1914, ibid., VIII, p. 358 (☿). F. SILVESTRI, 1914, 'Report Exped. to Africa in Search Nat. Enem. Fruit Flies,' p. 128 (☿), Pl. XXIV, fig. 49.

Type locality: Aburi, GOLD COAST (F. Silvestri).

Carebara WESTWOOD

Carebara WESTWOOD, 1840, Ann. Mag. Nat. Hist., VI, p. 86.

Genotype: *Carebara lignata* Westwood, 1840.

1. **Carebara ampla** SANTSCHI, 1912, Bull. Soc. Ent. France, p. 284 (♀, ♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 307.

Type locality: Majunga, BELGIAN CONGO (Gérard).

2. **Carebara arnoldi** (FOREL) SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 363, fig. 26 (☿). ARNOLD, 1916, Ann. South African Mus., XIV, p. 253 (☿).

Oligomyrmex arnoldi FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 123 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

3. **Carebara junodi** FOREL, 1904, Ann Soc. Ent. Belgique, XLVIII, p. 154 (♀). SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, pp. 363 and 364, fig. 24 (☿).

Carebara vidua subsp. *junodi* FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♀, ♂); 1913, Rev. Zool. Afr., II, p. 336 (☿, ♀, ♂). BEQUAERT, ibid., p. 428. ARNOLD, 1916, Ann. South African Mus., XIV, p. 252 (☿, ♀).

Type locality: Shilouvane, TRANSVAAL (H. Junod).

BELGIAN CONGO: Katanga (Lemaire); Sankisia (J. Bequaert); Kalumba; Katumba (Neave); Lake Moero.

4. **Carebara langi** WM. M. WHEELER. See p. 173 (♀).

Type locality: Stanleyville, BELGIAN CONGO (Lang and Chapin).

5. **Carebara osborni** WM. M. WHEELER. See p. 174 (☿, ♀, ♂).

Type locality: Niangara, BELGIAN CONGO (Lang and Chapin).

6. **Carebara sicheli** MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 754 (♀); 1863, ibid., XIII, p. 402. ROGER, 1863, 'Verzeich. Formicid.,' p. 32. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 74. MAYR, 1904, Verh. Zool. Bot. Ges. Wien, LIV, p. 596 (♀). SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 307 (☿).

Type locality: Senegal, SENEGAMBIA.

UPPER DAHOMEY. ANGLO-EGYPTIAN SUDAN: White Nile.

7. **Carebara silvestrii** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, pp. 362 and 364, fig. 23 (☿).

Type locality: Mamou, FRENCH GUINEA (F. Silvestri).

8. **Carebara vidua** F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 179 (♂). Roger, 1863, 'Verzeich. Formicid.,' p. 32. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 402; 1866, ibid., XVI, p. 904 (♀, ♂). Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 377 (♀, ♂). Distant, 1892, 'A Naturalist in the Transvaal,' p. 211. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 74. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 144 (♀). Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500 (♀, ♂). Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 392 (☿). Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 61 (♀, ♂). Wasmann, in Jägerskiold, 1904, 'Exped., XIII, Termitophilen,' p. 13 (☿). Zavattari, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 550, p. 2 (♀). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 12 (♀, ♂). Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 2 (♀). Forel, 1913, Rev. Zool. Afr., II, p. 337 (♀, ♂). Santschi, 1913, Ann. Soc. Ent. Belgique, XXXVII, p. 306 (♂); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 363, fig. 25 (♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 84 (☿, ♂). Arnold, 1916, Ann. South African Mus., XIV, p. 249 (☿, ♀, ♂), Pl. vi, figs. 79, 80. See p. 177.

Carebara colossus Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 263 (♀); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 512 (♀), Pl. xxxii, fig. 8. Roger, 1863, 'Verzeich. Formicid.,' p. 32. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 402.

Carebara dux F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 179 (♀). Roger, 1863, 'Verzeich. Formicid.,' p. 32. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 402.

Carebara vidua var. *dux* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (♀); 1913, Rev. Zool. Afr., II, p. 337 (♀).

Carabara vidua E. Warren, 1909, Ann. Natal Mus., II, pt. 1, p. 120.

Carebara vidua var. *abdominalis* Santschi, 1912, Bull. Soc. Ent. France, p. 285 (♀).

Carebara vidua subsp. *abdominalis* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ', p. 84 (♀).

Type locality: Port Natal, Natal.

Belgian Congo: Niangara; Faradje (Lang and Chapin); Yakuluku (J. Rodhain); Katanga (Lemaire); valley of the Lubumbashi (Buttgenbach); Kwesi to Kilo (Bayer). Anglo-Egyptian Sudan: Gebel Achmed Aga, White Nile (I. Tragårdh); Niam Niam. Eritrea: Keren (Beccari). Abyssinia: Sancurar to Amarr Burgi; Badditu to Dimé; Dimé to Bass Narok (V. Bottego). Somaliland: Giuba River (Elena d'Aosta). British East Africa: Bura, Wa-Taita; Kibwezi, Wakamba (C. Alluaud). Uganda: Kampala (C. C. Gowdey). Rhodesia: Hartley (Zeally); Kazungula (Jallá); Southern Rhodesia (G. Arnold); Lake Ngami. Portuguese East Africa: Tete (Peters). Transvaal: Pretoria (Distant; Wichgraf); Barberton (Rendall). Natal: (Haviland). German Southwest Africa: Okahandja (Casper; Dinter).

Pædalgus Forel

Pædalgus Forel, in Escherich, 1911, 'Termitenleben auf Ceylon,' p. 217.

Genotype: *Pædalgus escherichi* Forel, 1911.

1. **Pædalgus infimus** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 364, fig. 27 (☿).

Oligomyrmex infimus Santschi, 1913, Bull. Soc. Ent. France, p. 459 (☿).

Type locality: Kindia, French Guinea (F. Silvestri).

2. **Pædalgus termitolestes** Wm. M. Wheeler. See p. 177 (☿).

Type locality: Malela, Belgian Congo (Lang, Chapin and J. Bequaert).

Myrmecinini Ashmead

Terataner Emery

Terataner Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Genotype: *Atopomyrmex foreli* Emery, 1899.

1. **Terataner bottegoi** Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 72 (☿).

Atopomyrmex bottegoi Emery, 1896, Ann. Mus. Civ. Genova, XXXVII, p. 155, fig. (☿).

Atopomyrmex bottegi R. Gestro in Vanutelli and Citerni, 1899, 'Seconda Spedizione Bòttego, L'Omo' p. 626, fig. 19 (☿).

Type locality: Lugh, Somaliland (V. Bottego).

British East Africa: Voi, Taita, 600 m. (Alluaud and Jeannel).

2. **Terataner luteus** Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Atopomyrmex luteus Emery, 1899, ibid., XLIII, p. 477 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 145 (☿).

Type locality: Cameroon (Conradt).

Cameroon: Mundame (Conradt).

Atopomyrmex Ern. André

Atopomyrmex Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 226.

Genotype: *Atopomyrmex mocquerysi* Ern. André, 1889.

1. **Atopomyrmex mocquerysi** Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 227 (☿). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 562 (☿), Pl. xv, fig. 7. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 61. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 83. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 134. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 41. Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500 (☿). Mayr, in Jagerskiöld, 1903, 'Exped., IX, Formicid.,' p. 4 (☿); 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 387. Forel, in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 12 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 145 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 276 (☿). Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 102. Forel, 1913, Rev. Zool. Afr., II, p. 335 (♀, ♂). Bequaert, ibid., p. 428. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 351 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 71 (☿). **See p. 181.**

Atopomyrmex mocquerysi var. *australis* Santschi, 1914, Med. Goteborgs Mus. Zool. Afd., III, p. 16 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 193 (☿). **Same as type, *teste* Arnold *in litt*.**

Type locality: Dakar, Senegambia (Mocquerys).

Dahomey: Kotonou (F. Silvestri). Slave Coast. French Congo: Ogowe (Mocquerys). Belgian Congo: Lukolela to Basoko; Akenge; Medje; Faradje (Lang and Chapin); Matadi; Sankisia (J. Bequaert); Kondué (Luja). Angola.

Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh); Khor Attar (F. Werner). Abyssinia: Buditu to Bass Narok (V. Bottego). Somaliland. British East Africa: Voi, Wa-Taita, 600 m. (C. Alluaud). Zanzibar. Portuguese East Africa: Lobombo Borges. Mozambique (Wilms); Delagoa Bay (Liengme; P. Berthoud); Xalasi (C. W. Howard). North West Rhodesia: Mwengwa (H. Dollmann). Zululand: (I. Trägårdh).

1_1. Var. **curvispina** Forel, 1911, Deutsch. Ent. Zeitschr., p. 311 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 232; 1916, Rev. Suisse Zool., XXIV, p. 419 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 191 (☿, ♀).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: Lumbulumbu (H. Kohl). Southern Rhodesia: Sipapoma, Umgusa River; Malindi; Victoria Falls (G. Arnold). Zululand: (I. Trägårdh).

1a. Subsp. **cryptoceroides** (Emery) Forel, 1913, Rev. Zool. Afr., II, p. 336 (☿). Bequaert, ibid., p. 428. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 343 (♀). See p. 182.

Atopomyrmex cryptoceroides Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 561 (♀), Pl. xv, figs. 5 and 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 60. Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 477 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 145, fig. 10 (☿). Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 102. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 351 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 374 (☿).

Atopomyrmex deplanatus Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 133 (☿).

Type locality: Assinie, Ivory Coast (C. Alluaud).

French Guinea: Kakoulima; Mamou; Kindia (F. Silvestri). Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Gold Coast. Southern Nigeria: Ibadan (F. Silvestri). Cameroon: Mundame (Conradt). Fernando Po: (Conradt). Spanish Guinea: Alen; Uelleburg (Tessmann). French Congo: Fort de Possel to Fort Crampel (Schubotz); Kuilu River. Belgian Congo: Kondué (Luja); St. Gabriel; Bengamisa (Kohl); Malela; Elisabethville (J. Bequaert).

$1a_1$. Var. **melanoticus** Wm. M. Wheeler. See p. 182 (☿).

Type locality: between Lukolela and Basoko, Belgian Congo (Lang and Chapin).

Atopula Emery

Atopula Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 104.

Vollenhovia subg. *Atopula* Emery, 1912, ibid., LVI, p. 273.

Genotype: *Atopomyrmex nodifer* Emery, 1901.

1. **Atopula nodifera** Emery, 1912, Ann. Soc. Ent. Belgique, LVI, p. 104 (☿).

Atopomyrmex nodifer Emery, 1901, Deutsch. Ent. Zeitschr., p. 115, footnote, fig. (☿, ♀). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 421 (♀).

Type locality: Cameroon (L. Conradt).

Meranoplini Emery

Calyptomyrmex Emery

Calyptomyrmex Emery, 1887, Ann. Mus. Civ. Genova, XXV, p. 472.

Genotype: *Calyptomyrmex beccarii* Emery, 1887.

Subgenus 1. **Calyptomyrmex** EMERY, *sensu stricto*

Subgenotype: same as genotype.

1. **Calyptomyrmex arnoldi** (FOREL) ARNOLD, 1917, Ann. South African Mus., XIV, p. 360 (☿), Pl. VIII, figs. 114, 114a.

Dicroaspis arnoldi FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 115 (☿).

Type locality: Bulawayo, RHODESIA (G. Arnold).

2. **Calyptomyrmex nummulitica** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 352 (☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

3. **Calyptomyrmex stellatus** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 255, fig. 5 (☿).

Type locality: Gaboon, FRENCH CONGO (F. Faure).

Subgenus 2. **Dicroaspis** EMERY

Dicroaspis EMERY, 1908, Ann. Soc. Ent. Belgique, LII, p. 184.

Calyptomyrmex subg. *Dicroaspis* EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 15.

Subgenotype: *Dicroaspis cryptocera* Emery, 1908.

4. **Calyptomyrmex (Dicroaspis) claviseta** (SANTSCHI).

Dicroaspis claviseta SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 27 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 362 (☿).

Type locality: Pietermaritzburg, NATAL (I. Trägårdh).

5. **Calyptomyrmex (Dicroaspis) cryptocerus** (EMERY).

Dicroaspis cryptocera EMERY, 1908, Ann. Soc. Ent. Belgique, LII, p. 185, fig. 1 (☿, ♀). WASMANN, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 145.

Type locality: Stanleyville, BELGIAN CONGO (Kohl).

5a. Var. **lævidens** SANTSCHI, 1919, Rev. Zool. Afr., VII, p. 88 (☿).

Type locality: Yambuya, BELGIAN CONGO (J. Bequaert).

6. **Calyptomyrmex (Dicroaspis) foreli** EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 15.

Dicroaspis emeryi FOREL, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 262 (☿). SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 311 (☿, ♀). (*nec Calyptomyrmex emeryi* Forel, 1901).

Type locality: Ghinda, ERITREA (K. Escherich; F. Silvestri).

ABYSSINIA: Harar (Reichensperger).

7. **Calyptomyrmex (Dicroaspis) pusillus** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 256 (☿).

Type locality: Gaboon, FRENCH CONGO (F. Faure).

Meranoplus F. SMITH

Meranoplus F. SMITH, 1854, Trans. Ent. Soc. London, (2) II, p. 224.

Cryptocerus (part) GUÉRIN, F. SMITH, LOWNE. *Myrmica* (part) JERDON.

Genotype: *Cryptocerus bicolor* Guérin, 1845.

1. **Meranoplus bondroiti** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 254, fig. 4 (☿).

Type locality: Uzaga, region of the Great Lakes, BELGIAN CONGO (Gérard).

2. **Meranoplus excisus** Arnold, 1914, Proc. Rhodesia Sc. Assoc., XIII, p. 29, Pl., fig. 9 (☿); 1917, Ann. South African Mus., XIV, p. 367 (☿).

Type locality: Estcourt, Natal (R. C. Wroughton).

3. **Meranoplus magrettii** Ern. André, in Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 543, fig. A (☿); in Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 245, fig. 1a (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 137. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 201 (☿; var.?). Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 79. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39 (var.?).

Type locality: Suakin, Anglo-Egyptian Sudan (Magretti).

Southern Abyssinia: (Ilg). German East Africa: Bagamoyo (F. Stuhlmann; var.?).

4. **Meranoplus nanus** Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 55 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 137. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 351 (☿, ♀). Arnold, 1917, Ann. South African Mus., XIV, p. 365 (☿).

Type locality: Gaboon, French Congo.

French Guinea: Kindia (F. Silvestri).

4a. Subsp. **inermis** (Emery).

Meranoplus inermis Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 41 (☿), Pl. II, fig. 24; 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 15 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 365 (☿).

Type locality: Makapan, Transvaal (E. Simon).

Eritrea: Asmara (F. Silvestri).

4*b*. Subsp. **nanior** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 12 (☿). Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 506. Arnold, 1917, Ann. South African Mus., XIV, p. 366 (☿).

Type locality: Mto-ya-Kifaru, German East Africa (Katona).

Rhodesia: Victoria Falls (G. Arnold).

4*b*$_1$. Var. **kiboshanus** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 12 (☿).

Type locality: Kibosho, German East Africa (Katona).

4*c*. Subsp. **soriculus** Wm. M. Wheeler. See p. 184 (☿, ♀, ♂).

Type locality: Avakubi, Belgian Congo (Lang and Chapin).

Belgian Congo: Medje (Lang and Chapin).

5. **Meranoplus peringueyi** Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 365 (☿), Pl. XVII, fig. 12. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 137. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 116 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 368 (☿), Pl. VIII, figs. 115, 115a.

Type locality: Cape of Good Hope (L. Péringuey).

Cape Province: Willowmore (H. Brauns).

6. **Meranoplus simoni** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 41 (♀), Pl. II, fig. 23. Arnold, 1917, Ann. South African Mus., XIV, p. 369 (♀).

Type locality: Vrijburg, Cape Province (E. Simon).

6a. Subsp. **nitidiventris** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XIV, p. 26 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 116 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 370 (☿, ♀, ♂).

Type locality: Bothaville, Orange Free State (H. Brauns).

Rhodesia: Bulawayo (G. Arnold).

$6a_1$. Var. **springvalensis** Arnold, 1917, Ann. South African Mus., XIV, p. 372 (☿).

Type locality: Springvale, Southern Rhodesia (G. Arnold).

6b. Subsp. **suturalis** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 424 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 370 (☿).

Type locality: Natal (Haviland).

7. **Meranoplus spininodis** Arnold, 1917, Ann. South African Mus., XIV, p. 366 (☿).

Type locality: Hillside, Bulawayo, Southern Rhodesia (G. Arnold).

Leptothoracini Emery

Macromischoides Wm. M. Wheeler

Macromischoides Wm. M. Wheeler, 1920, Psyche, XXVII, p. 53.

Genotype: *Macromischa aculeata* Mayr, 1866.

1. **Macromischoides aculeatus** (Mayr). See p. 189.

Macromischa aculeata Mayr, 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 507 (☿). Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 224 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 120. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (♀). Mayr, 1896, Ent. Tidskr., XVII, p. 238. Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 301 (☿). Mayr, 1902, Verh. Zool. Bot. Ges. Wien, p. 292 (☿, ♀, ♂). Wasmann, 1906, Tijdschr. v. Ent., XLVIII, p. 213, Pl. viii, fig. 3 (nest).

Tetramorium aculeatum Emery, 1896, Bull. Soc. Ent. France, p. 103; 1908, Ann. Soc. Ent. Belgique, LII, p. 187 (♂). Forel, 1909, ibid., LIII, p. 59 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 385 (☿, ♀, ♂). Forel, 1913, Rev. Suisse Zool., XXI, p. 668 (☿, ♀); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (☿, ♀). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿). H Schmitz, 1915, Deutsch. Ent. Zeitschr., p. 494. Forel, 1916, Rev. Suisse Zool., XXIV, p. 420 (☿, ♀, ♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 393 (☿, ♀), Pl. xxi (nest). Strand, 1917, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VI, p. 41.

Type locality: Gold Coast.

French Guinea: Los Islands (H. Brauns). Sierra Leone: (Mocquerys). Cameroon: (Sjöstedt); Abo (R. Buchholz); Victoria (F. Silvestri); Ekona (Hintz). French Congo: Ogowe (Mocquerys); Brazzaville (A. Weiss). Belgian Congo: St. Gabriel (H. Kohl); Kasai, Kondué; Sankuru (Luja); Lukula (Daniel); Mayombe (de Briey); Duma (Schubotz); Kimuenza (Schultze); Bumba (J. Bequaert); Stanleyville; Avakubi; Bafuka; Medje; Leopoldville; Isangi (Lang and Chapin); Lower Congo (Solon); Lingunda.

1_1. Var. **major** (Forel).

Tetramorium aculeatum var. *major* Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 344 (☿); 1916, Rev. Suisse Zool., XXIV, p. 420 (☿, ♀).

Type locality: St. Gabriel, Belgian Congo (Kohl).

1_2. Var. **rubroflavus** (Forel).

Tetramorium aculeatum var. *rubroflava* Forel, 1916, Rev. Suisse Zool., XXIV, p. 420 (☿).

1_3. Var. **wasmanni** (Forel). See p. 190.

Macromischa wasmanni Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 300 (☿).

Tetramorium aculeatum var. *wasmanni* FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 71 (☿, ♀, ♂). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 385 (☿, ♀). FOREL, 1916, Rev. Suisse Zool., XXIV, p. 420 (☿, ♀).

Tetramorium aculeatum subsp. *wasmanni* WASMANN, 1912, Zeitschr. Wiss. Zool., CI, p. 104. REICHENSPERGER, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 125.

Type locality: Leopoldville, BELGIAN CONGO.

FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Sankuru (Luja); St. Gabriel (Kohl); Zambi; Stanleyville (Lang and Chapin).

1a. Subsp. **andricus** (EMERY).

Tetramorium aculeatum subsp. *andricum* EMERY, 1908, Ann. Soc. Ent. Belgique, LII, p. 187 (☿, ♀, ♂). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 385 (☿, ♀, ♂). FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (☿).

Type locality: Stanleyville, BELGIAN CONGO (Kohl).

FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Kisantu (J. Bequaert).

1a$_1$. Var. **gladiator** (SANTSCHI).

Tetramorium aculeatum subsp. *andricum* var. *gladiator* SANTSCHI, 1919, Rev. Zool. Afr., VI, p. 248 (☿).

Type locality: Congo da Lemba, BELGIAN CONGO (R. Mayné).

2. **Macromischoides africanus** (MAYR).

Macromischa africana MAYR, 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 507 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 120. FOREL, 1901, Mitth. Schweiz. Ent. Ges., X, p. 301 (☿). MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 131 (♀).

Tetramorium africanum EMERY, 1896, Bull. Soc. Ent. France, p. 103. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 385 (☿, ♀). FOREL, 1911, Rev. Zool. Afr., I, p. 279 (☿). SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿). FOREL, 1916, Rev. Suisse Zool., XXIV, p. 421 (☿).

Type locality: GOLD COAST.

FRENCH GUINEA: Konakry (F. Silvestri). NIGERIA: Old Calabar (H. Brauns). CAMEROON: Victoria (F. Silvestri); Mbalmajo to Ekeneli (G. Schwab). FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Congo da Lemba (R. Mayné); St. Gabriel (Kohl).

Leptothorax MAYR

Leptothorax MAYR, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 431.

Formica (part) FABRICIUS, etc. *Macromischa* EMERY. *Myrmica* (part) NYLANDER, etc. *Stenamma* CURTIS, F. SMITH, PATTON.

Genotype: *Myrmica clypeata* Mayr, 1853.

Subgenus **Goniothorax** EMERY

Leptothorax subg. *Goniothorax* EMERY, 1896, Bull. Soc. Ent. Italiana, XXVIII, p. 26.

Subgenotype: *Leptothorax vicinus* Mayr, 1887.

1. **Leptothorax (Goniothorax) angulatus** MAYR.

Leptothorax angulatus MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 739 (☿); 1863, ibid., XIII, p. 426. ERN. ANDRÉ, 1883, 'Spec. Hym. Europ. Algérie,' II,

p. 295 (☿). EMERY, 1891, 'Explor. Tunisie, Fourmis,' p. 5. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 123. FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 233 (☿). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 107 (☿, ♀). ARNOLD, 1916, Ann. South African Mus., XIV, p. 258 (☿), Pl. v, figs. 56, 56a.

Type locality: Sinai Peninsula (R. v. Frauenfeld).

TUNIS. CENTRAL UGANDA: (C. Alluaud). SOUTHERN RHODESIA: Khami River; Matoppo Hills (G. Arnold).

1a. Subsp. **concolor** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 107, fig. 15 (☿, ♀). EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 16 (☿, ♀, ♂).

Type locality: Mombasa, BRITISH EAST AFRICA (Alluaud and Jeannel).

ERITREA: Mayabal (F. Silvestri).

1*b*. Subsp. **ilgi** FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 82 (☿). SANTSCHI, 1912, Bull. Soc. Hist. Nat. Afr. Nord, IV, p. 148 (☿, ♀).

Type locality: SOUTHERN ABYSSINIA (Ilg).

FRENCH SOMALILAND: Obock (Maindron).

2. **Leptothorax (Goniothorax) denticulatus** MAYR.

Leptothorax denticulatus MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 5 (☿, ♀). ARNOLD, 1916, Ann. South African Mus., XIV, p. 260 (☿, ♀).

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

3. **Leptothorax (Goniothorax) evelynæ** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 423 (☿, ♀).

Type locality: St. Gabriel, BELGIAN CONGO (Kohl).

4. **Leptothorax (Goniothorax) grisoni** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 423 (☿, ♂).

Type locality: St. Gabriel, BELGIAN CONGO (Kohl).

5. **Leptothorax (Goniothorax) innocens** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 423 (☿).

Tetramorium (Leptothorax?) innocens FOREL, 1913, Rev. Zool. Afr., II, p. 317 (☿). BEQUAERT, ibid., p. 424.

Type locality: Elisabethville, BELGIAN CONGO (J. Bequaert).

6. **Leptothorax (Goniothorax) latinodis** MAYR. See p. 1029.

Leptothorax latinodis MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 130 (☿). ARNOLD, 1916, Ann. South African Mus., XIV, p. 259 (☿).

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (H. Brauns).

Ocymyrmicini Emery

Ocymyrmex EMERY

Ocymyrmex EMERY, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 364.

Genotype: *Ocymyrmex barbiger* Emery, 1886.

1. **Ocymyrmex barbiger** EMERY, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 364 (☿, ♂), Pl. xvii, figs. 9-11. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 72. EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 26. ARNOLD, 1916, Ann. South African Mus., XIV, p. 199 (☿, ♂), Pl. v, fig. 53.

Ocymyrmex barbatus EMERY, 1892, Ann. Mus. Civ. Genova, XXXII, p. 117 (☿).

Type locality: Cape of Good Hope (L. Péringuey).

CAPE PROVINCE: Cape Town (E. Simon); Orange River (G. Arnold). BECHUANALAND: Magalapye (G. Arnold).

2. **Ocymyrmex laticeps** Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 306 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 561 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

3. **Ocymyrmex picardi** Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 306 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 561 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 13 (☿). Arnold, 1916, Ann. South African Mus., XIV, p. 199 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

Bechuanaland: Severelela; Severelela to Kooa (L. Schultze).

4. **Ocymyrmex robecchii** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, pp. 114 and 116, fig. (☿). Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 352 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 72. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 178.

Type locality: Webi, Abyssinia (Bricchetti-Robecchi).

Somaliland: (C. Keller); Erdal (Pavesi). Abyssinia: Middle Ganale (V. Bottego).

4a. Subsp. **nitidulus** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 116 (☿); 1896, ibid., XXXVII, p. 157 (☿, ♂).

Ocymyrmex robecchii var. *nitidulus* Emery, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 83.

Ocymyrmex nitidulus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 72.

Type locality: Obbia, Somaliland (Bricchetti-Robecchi).

Abyssinia: Junction of Webi and Ganale Rivers (V. Bottego); southern Abyssinia (Ilg). Somaliland: Lugh (V. Bottego).

5. **Ocymyrmex weitzeckeri** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 116, footnote (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 72. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 26 (☿, ♂). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru., etc.,' II, 8, p. 12 (☿).

Ocymyrmex weitzackeri Arnold, 1916, Ann. South African Mus., XIV, p. 195 (☿, ♂), Pl. v, fig. 54.

Type locality: Leribe, Basutoland (Weitzecker).

Cape Province: Vrijburg; Kimberley (E. Simon). Transvaal: Makapan; Hamman's Kraal (E. Simon). Orange Free State. German East Africa: Ngarena-Nyuki, Meru Plain (Sjöstedt).

5₁. Var. **arnoldi** (Forel).

Ocymyrmex arnoldi Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 138 (☿, ♂).

Ocymyrmex weitzäckeri subsp. *arnoldi* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 213 (☿).

Ocymyrmex weitzekeri subsp. *abdominalis* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 16 (☿).

Ocymyrmex weitzackeri var. *arnoldi* Arnold, 1916, Ann. South African Mus., XIV, p. 197 (☿, ♂), Pl. v, figs. 52, 52a, and 55.

Type locality: Bulawayo, Rhodesia (G. Arnold).

Zululand: Entendweni (I. Trägårdh). Southern Rhodesia: common (G. Arnold).

5_2. Var. **foreli** (Arnold).

Ocymyrmex weitzackeri var. *foreli* Arnold, 1916, Ann. South African Mus., XIV, p. 197 (☿).

Type locality: Redbank, Southern Rhodesia (G. Arnold).

Rhodesia: Victoria Falls (G. Arnold).

5a. Subsp. **fortior** Santschi, 1911, Rev. Zool. Afr., I, p. 209 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

5b. Subsp. **hirsutus** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 13 (☿).

Ocymyrmex weitzackeri subsp. *hirsutus* Arnold, 1916, Ann. South African Mus., XIV, p. 198 (☿).

Type locality: Severelela, Bechuanaland (L. Schultze).

Bechuanaland: Kooa (L. Schultze).

$5b_1$. Var. **flaviventris** (Santschi).

Ocymyrmex hirsutus var. *flaviventris* Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 431 (☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 254 (☿).

Type locality: Windhoek, German Southwest Africa.

Originally described, by error, from German East Africa.

5c. Subsp. **transversus** Santschi, 1911, Rev. Zool. Afr., I, p. 209 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

5d. Subsp. **wroughtoni** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika, IV, p. 13 (☿).

Ocymyrmex weitzackeri subsp. *wroughtoni* Arnold, 1916, Ann. South African Mus., XIV, p. 198 (☿).

Type locality: Natal (R. C. Wroughton).

$5d_1$. Var. **micans** (Forel).

Ocymyrmex weitzeckeri var. *micans* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 12 (☿).

Ocymyrmex weitzackeri subsp. *wroughtoni* var. *micans* Arnold, 1916, Ann. South African Mus., XIV, p. 198 (☿).

Type locality: Okahandja, German Southwest Africa (Peters).

Tetramoriini Emery

Tetramorium Mayr

Tetramorium Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 423.

Tetrogmus Roger, 1857, Berlin. Ent. Zeitschr., I, p. 10.

Atta Illiger. *Formica* Linnæus, etc. *Leptothorax* F. Smith. *Myrmica* Latreille, etc.

Genotype: *Formica cæspitum* Linnæus, 1758.

1. **Tetramorium arnoldi** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 19, footnote.

Triglyphothrix arnoldi Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 220 (☿).

Tetramorium (Triglyphothrix) arnoldi Arnold, 1917, Ann. South African Mus., XIV, p. 338 (☿, ♀), Pl. vii, fig. 93.

Type locality: Shiloh, Southern Rhodesia (G. Arnold).

Rhodesia: Bulawayo (G. Arnold).

2. **Tetramorium bacchus** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 426 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 309 (☿).

Type locality: Natal (Haviland).

3. **Tetramorium bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 318 (☿). Bequaert, ibid., p. 424. Arnold, 1917, Ann. South African Mus., XIV, p. 281 (☿). Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿).

Type locality: Lake Kabwe, Belgian Congo (J. Bequaert).

3*a*. Subsp. **bulawayense** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 119 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 281 (☿, ♀). Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿).

Type locality: Bulawayo, Rhodesia (Arnold).

$3a_1$. Var. **bruni** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿).

Tetramorium bequaerti subsp. *bruni* Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 285 (☿).

Type locality: Hillside, Southern Rhodesia (Arnold).

4. **Tetramorium cæspitum** (Linnæus) Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 426 (☿, ♀, ♂).

Formica cæspitum Linnæus, 1758, 'Syst. Nat.,' Ed. 10, I, p. 581 (☿).

Type locality: "Europa."

Europe, tending to become circumpolar.

4_1. Var. **nefassitense** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 260 (☿).

Type locality: Nefasit, Eritrea (K. Escherich).

4*a*. Subsp. **altivagans** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 103 (☿).

Type locality: Kinangop, Aberdare Mts., 3100 m., British East Africa (Alluaud and Jeannel).

4*b*. Subsp. **nautarum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 156 (☿).

Type locality: Annobon Island (Reichensperger).

4*c*. Subsp. **schultzei** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 19 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 367 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 331 (☿).

Type locality: Kgokong to Kang, Bechuanaland (L. Schultze).

Cape Province: Stellenbosch.

5. **Tetramorium camerunense** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 129 (☿).

Type locality: Cameroon (H. Brauns).

5_1. Var. **gegaimi** Forel, 1916, Rev. Suisse Zool., XXIV, p. 421 (☿, ♀).

Type locality: St. Gabriel, Belgian Congo (Kohl).

5_2. Var. **waelbroeki** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 53 (☿). *Tetramorium camerunense* var. *woelbroecki* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 367, fig. 29 (☿).

Type locality: Kinshasa, Belgian Congo (Waelbroeck).

Southern Nigeria: Lagos (F. Silvestri).

6. **Tetramorium capense** Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 89 (☿); 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 972 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 133. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 36 (☿, ♀,

♂). SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 435; 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿, ♀). ARNOLD, 1917, Ann. South African Mus., XIV, p. 310 (☿, ♀, ♂).

Tetramorium braunsi FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 119 (☿).

Tetramorium capense var. *braunsi* FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 220. ARNOLD, 1917, Ann. South African Mus., XIV, p. 311 (☿).

Type locality: Cape of Good Hope (Novara Expedition).

CAPE PROVINCE: Cape Town (E. Simon); Constantia; Willowmore (H. Brauns); East London.

7. **Tetramorium coloreum** MAYR, 1900, Ent. Tidskr., XXI, p. 273 (☿).

Type locality: Mungo River, CAMEROON (R. Buchholz).

7_1. Var. **postpetiolatum** SANTSCHI, 1919, Rev. Zool. Afr., VII, p. 88 (☿).

Type locality: Penge, BELGIAN CONGO (J. Bequaert).

8. **Tetramorium doriæ** EMERY, 1881, Ann. Mus. Civ. Genova, XIV, p. 530 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 133.

Type locality: Assab, ERITREA (Doria and Beccari).

9. **Tetramorium emeryi** MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 23 (☿, ♀, ♂). ARNOLD, 1917, Ann. South African Mus., XIV, p. 300 (☿, ♀, ♂).

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

9a. Subsp. **cristulatum** FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 218 (☿, ♂). ARNOLD, 1917, Ann. South African Mus., XIV, p. 302 (☿, ♀, ♂).

Type locality: Willowmore, CAPE PROVINCE (H. Brauns).

10. **Tetramorium ericæ** ARNOLD, 1917, Ann. South African Mus., XIV, p. 332 (☿).

Type locality: Hillside, Bulawayo, SOUTHERN RHODESIA (G. Arnold).

11. **Tetramorium frenchi** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 229 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 285 (☿).

Type locality: Krantzkloof, Durban, NATAL (Marley).

12. **Tetramorium gladstonei** FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 219 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 284 (☿).

Tetramorium sericeiventre subsp. *gladstonei* SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 125 (☿) (by misprint).

Type locality: Shiloh, SOUTHERN RHODESIA (G. Arnold).

12_1. Var. **sepositum** SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 125 and 131 (☿).

Type locality: Victoria Falls, RHODESIA (G. Arnold).

RHODESIA: Bulawayo (G. Arnold).

13. **Tetramorium gracile** FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 81 (☿); 1907, Rev. d'Ent. Caen, XXVI, p. 136 (♂?).

Type locality: SOUTHERN ABYSSINIA (Ilg).

ABYSSINIA: Adis Abeba (de Rothschild).

14. **Tetramorium grandinode** SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 308 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 312 (☿).

Type locality: Cape of Good Hope.

14_1. Var. **hopense** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 223 (☿, ♀). ARNOLD, 1917, Ann. South African Mus., XIV, p. 313 (☿, ♀), Pl. VII, figs. 103, 103*a*, 103*b*.

Type locality: Hopetown, CAPE PROVINCE.

15. **Tetramorium grassii** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 37 (☿, ♀). Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 25 (☿, ♀). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿, ♀).

Tetramorium grassi Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿, ♀). Arnold, 1917, Ann. South African Mus., XIV, p. 304 (☿, ♀), Pl. VII, fig. 105.

Type locality: Cape Town, Cape Province (E. Simon).

Cape Province: Kimberley (E. Simon); Table Mt., 1500 ft. (G. Arnold); Port Elizabeth (H. Brauns); Constantia.

15_1. Var. **lævigatum** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 25 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 305 (☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

15_2. Var. **simulans** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 24 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 305 (☿).

Type locality: Richmond, Natal (I. Trägårdh).

16. **Tetramorium guineense** (Fabricius) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 740; 1863, ibid., XIII, p. 456. Roger, 1863, 'Verzeich. Formicid.,' p. 27. Mayr, 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 972 (☿). Blackburn and Kirby, 1880, Ent. Monthly Mag., XVII, p. 88. Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 288, 289, 290 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 133. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 130. Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 135 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 260 (☿); 1913, Rev. Zool. Afr., II, p. 319 (♀). Bequaert, ibid., p. 425. Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 306 (☿). See pp. 192 and 1030.

Formica guineensis Fabricius, 1793, 'Ent. Syst.,' II, p. 357 (☿). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 285 (☿). Fabricius, 1804, 'Syst. Piez.,' p. 404 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32.

Myrmica bicarinata Nylander, 1847, Acta Soc. Sc. Fennicæ, II, p. 1061 (☿, ♀). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 130.

Myrmica cariniceps Guérin, 1852, Rev. Mag. Zool., (2) IV, p. 79 (♀).

Myrmica kollari Mayr, 1853, Verh. Zool. Bot. Ges. Wien, III, p. 283 (☿, ♀, ♂).

Tetramorium kollari Mayr, 1855, ibid., V, p. 425 (☿, ♀, ♂). Sichel, 1856, Ann. Soc. Ent. France, (3) IV, Bull., p. xxiv. White, 1883, 'Ants and Their Ways,' p. 262 (☿).

Tetramorium cariniceps Roger, 1861, Berlin. Ent. Zeitschr., V, p. 171.

Myrmica reticulata F. Smith, 1862, Trans. Ent. Soc. London, (3) I, p. 33 (☿); 1871, Ent. Annual for 1871, p. 60.

Myrmica guineensis Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 293.

Myrmica (Tetramorium) kollari F. Smith, 1871, Ent. Annual for 1871, p. 60.

Type locality: Guinea (Isert).

Tropicopolitan. French Guinea: Los Islands. Eritrea: Nefasit (F. Silvestri). Abyssinia: western part (Ilg); confluent of the Akaki River (de Rothschild). Belgian Congo: Elisabethville (J. Bequaert); Ngayu (Lang and Chapin).

16_1. Var. **erectum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 37 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 307 (☿).

Type locality: Vrijburg, Cape Province (E. Simon).

16$_2$. Var. **phasias** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 307 (☿).

Type locality: Durban, Natal (C. B. Cooper).

16*a*. Subsp. **cristatum** (Stitz) Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 117 (☿).

Tetramorium guineense var. *cristatum* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿).

Type locality: Bismarckburg, Togo (Conradt).

Rhodesia: Bulawayo (G. Arnold).

16*b*. Subsp. **medje** Wm. M. Wheeler. See p. 192 (☿).

Type locality: Medje, Belgian Congo (Lang and Chapin).

16*c*. Subsp. **peutli** Forel, 1916, Rev. Suisse Zool., XXIV, p. 419 (☿, ♀).

Type locality: Belgian Congo (H. Kohl).

16*d*. Subsp. **striatum** (Stitz) Arnold, 1917, Ann. South African Mus., XIV, p. 308 (☿, ♀, ♂).

Tetramorium guineense var. *striatum* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿).

Type locality: Bismarckburg, Togo (Conradt).

Southern Rhodesia: (G. Arnold).

17. **Tetramorium humile** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 434 (☿, ♀).

Type locality: Moregoro, German East Africa.

18. **Tetramorium intextum** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 104, fig. 14 (☿); 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 506, fig. A (☿).

Type locality: Blue Post Hotel, Kikuyu, 1520 m., British East Africa (Alluaud and Jeannel).

18$_1$. Var. **cataractæ** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 506, fig. B (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 322 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

19. **Tetramorium jauresi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 296 (☿), Pl. vii, fig. 99.

Type locality: Park Rynie, Natal (Marley).

20. **Tetramorium joffrei** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 228 (☿, ♀). Arnold, 1917, Ann. South African Mus., XIV, p. 303 (☿, ♀), Pl. vii, fig. 97.

Type locality: Durban, Natal (G. Arnold).

20$_1$. Var. **algoa** Arnold, 1917, Ann. South African Mus., XIV, p. 304 (☿, ♀).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

21. **Tetramorium lævithorax** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 39 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 286 (☿), Pl. viii, figs. 110, 110*a*.

Type locality: Pietermaritzburg, Natal (Weitzecker).

Cape Province: Port Elizabeth (H. Brauns).

22. **Tetramorium lobulicorne** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 504 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 298 (☿, ♀, ♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

23. **Tetramorium longicorne** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 13 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 119 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 219 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 283 (☿), Pl. vii, figs. 96, 96a.

Type locality: Mto-ya-Kifaru, German East Africa (Katona).

Rhodesia: Bulawayo (G. Arnold).

24. **Tetramorium longoi** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 344 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 321 (☿).

Type locality: George, Cape Province (H. Brauns).

25. **Tetramorium luteipes** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 24, footnote.

Tetramorium grassi subsp. *luteipes* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 383, fig. 11 (☿, ♀, ♂).

Type locality: Brazzaville, French Congo (A. Weiss).

26. **Tetramorium meressei** Forel, 1916, Rev. Suisse Zool., XXIV, p. 422 (☿). See p. 192.

Type locality: Belgian Congo (Kohl).

Belgian Congo: Masaki between Masisi and Walikale (J. Bequaert).

27. **Tetramorium microgyna** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 132 (☿).

Type locality: Natal (Haviland).

28. **Tetramorium miserabile** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 153 (☿).

Type locality: British East Africa (Reichensperger).

29. **Tetramorium neuvillei** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 135 (☿).

Type locality: Diré Daua, Abyssinia (de Rothschild).

30. **Tetramorium oculatum** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 116 (☿).

Type locality: Redbank, Rhodesia (G. Arnold).

31. **Tetramorium pauper** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 14 (☿).

Type locality: Mto-ya-Kifaru, German East Africa (Katona).

31*a*. Subsp. **nigrum** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 15 (☿).

Type locality: Mto-ya-Kifaru, German East Africa (Katona).

31*b*. Subsp. **transformans** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 104 (☿).

Type locality: Shimoni, British East Africa (Alluaud and Jeannel).

32. **Tetramorium popovici** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 230 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 311 (☿, ♀).

Type locality: Table Mt., 1500 ft., Cape Province (G. Arnold).

33. **Tetramorium pusillum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 38 (☿, ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 382, fig. 10a (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 323 (☿, ♀).

Type locality: Cape Town, Cape Province (E. Simon).

33_1. Var. **anxium** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 365, fig. 28 (☿, ♀).

Type locality: Camayenne, French Guinea (F. Silvestri).

33_2. Var. **bantouanum** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 382, fig. 10*b* (☿, ♂).

Type locality: Mbamu, French Congo (A. Weiss).

33_3. Var. **exoletum** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿).

Type locality: Lagos, Southern Nigeria (F. Silvestri).

33_4. Var. **hemisi** Wm. M. Wheeler. See p. 193 (☿).

Type locality: Niangara, Belgian Congo (Lang and Chapin).

33_5. Var. **mossamedense** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 223. Arnold, 1917, Ann. South African Mus., XIV, p. 324 (☿).

Tetramorium cæspitum var. *mossamedense* Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 306 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 560 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 117.

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

Rhodesia: Bulawayo (G. Arnold).

33_6. Var. **triste** (Santschi).

Tetramorium pusillum subsp. *mosamedense* var. *tristis* Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 285 (☿).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

33a. Subsp. **ghindanum** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 223. Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Tetramorium cæspitum subsp. *ghindanum* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 260 (☿).

Type locality: Ghinda, Eritrea (K. Escherich; F. Silvestri).

33*b*. Subsp. **ladismithense** (Forel) Arnold, 1917, Ann. South African Mus., XIV, p. 325 (☿).

Tetramorium cæspitum subsp. *ladismithensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 117 (☿).

Tetramorium pusillum subsp. *ladysmithensis* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 223.

Type locality: Ladismith, Cape Province (H. Brauns).

33*c*. Subsp. **tablense** (Forel) Arnold, 1917, Ann. South African Mus., XIV, p. 326 (☿, ♀, ♂).

Tetramorium pusillum var. *tablensis* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 223 (☿, ♀, ♂).

Type locality: Table Mt., Cape Province (G. Arnold).

34. **Tetramorium pygmæum** Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 371 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 134. Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 62 (♀, ♂); 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 17 (☿).

Type locality: Keren, Eritrea (Beccari).

Eritrea: Bizen (A. Fiori); Massaua (Belli).

35. **Tetramorium quadridentatum** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿).

Type locality: Mundame, Cameroon (Conradt).

36. **Tetramorium quadrispinosum** Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 362 (☿), Pl. xvii, fig. 8. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 134.

FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 80. EMERY, 1895, Ann. Soc Ent. France, LXIV, p. 36. WASMANN, 1899, Notes Leyden Mus., XXI, p. 51; 1911, Tijdschr. v. Ent., LIV, p. 201; 1912, Zeitschr. Wiss. Zool., CI, p. 107. FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿). REICHENSPERGER, 1915, Med. Göteborgs Mus. Zool. Afd., V, pp. 45 and 73. ARNOLD, 1917, Ann. South African Mus., XIV, p. 277 (☿). SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿). See p. 1030.

Type locality: Cape of Good Hope (L. Péringuey).

CAPE PROVINCE: Table Mt. (G. Arnold); Cape Town (E. Simon); Willowmore (H. Brauns). NATAL: (R. C. Wroughton). DELAGOA: (Liengme).

36*a*. Subsp. **elegans** SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 122 and 125 (☿).

Type locality: Willowmore, CAPE COLONY (G. Arnold).

36*b*. Subsp. **eudoxium** (FOREL) SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿).

Tetramorium blochmanni subsp. *continentis* var. *eudoxia* FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 231 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 280 (☿).

Type locality: Willowmore, CAPE PROVINCE (G. Arnold).

37. **Tetramorium semireticulatum** ARNOLD, 1917, Ann. South African Mus., XIV, p. 319 (☿, ♂).

Type locality: Hillside District, Bulawayo, SOUTHERN RHODESIA (G. Arnold).

38. **Tetramorium sericeiventre** EMERY, 1877, Ann. Mus. Civ. Genova, IX, p. 370 (☿). MAGRETTI, 1884, ibid., XXI, p. 539 (☿). ERN. ANDRÉ, 1885, 'Spec. Hym. Europ. Algérie,' II, Suppl., p. 851 (☿) (p. 19 of reprint). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 134. EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 37; 1896, Ann. Mus. Civ. Genova, XXXVII, p. 158 (☿); 1909, Deutsch. Ent. Zeitschr., p. 697, fig. 1 (☿). FOREL, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 261 (☿, ♀). GESTRO, 1911, Bull. Soc. Ent. Italiana, XLI, (1909), p. 258. FOREL, 1911, Sitzb. Bayer. Akad. Wiss., p. 266 (☿); 1913, Rev. Zool. Afr., II, p. 319 (☿). BEQUAERT, ibid., p. 424. SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 101 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 366 (☿). EMERY, 1915, ibid., X, p. 4 (☿, ♀). SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 125 (☿). See pp. 191 and 1030.

Tetramorium sericiventre MAGRETTI, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿).

Type locality: Sciotel, ERITREA (Beccari).

FRENCH GUINEA: Konakry (F. Silvestri). SIERRA LEONE. NIGERIA: Old Calabar (Bates); Ibadan (F. Silvestri). BELGIAN CONGO: Thysville; Bukama (J. Bequaert); Garamba (Lang and Chapin). GERMAN EAST AFRICA: Moschi, Mt. Kilimandjaro, 1120 m. (Alluaud and Jeannel). SOMALILAND: Matagoi to Lugh (V. Bottego). ERITREA: Asmara (K. Escherich); Nefasit (K. Escherich; F. Silvestri); Ghinda (F. Silvestri). ANGLO-EGYPTIAN SUDAN: El Hefera, Settit (Magretti).

38_1. Var. **arenarium** SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 126 (☿).

Type locality: Kairouan, TUNIS (Santschi).

ALGERIA. SENEGAMBIA: Fello (Claveau). ABYSSINIA: Harar (Reichensperger).

38_2. Var. **bipartitum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 126 (☿).

Type locality: British East Africa (Le Moult).

38_3. Var. **debile** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 80 (☿). Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 124 (☿).

Type locality: Southern Abyssinia (Ilg).

38_4. Var. **gamai** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 128 (☿).

Type locality: Gwaai, Rhodesia (G. Arnold).

38_5. Var. **hori** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 125 (☿).

Tetramorium sericeiventre Karawaiew, 1911, Rev. Russe Ent., XI, p. 8 (☿).

Type locality: Khartum, Anglo-Egyptian Sudan (Karawaiew).

38_6. Var. **jasonis** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 127 (☿, ♀).

Type locality: Jacqueville, Ivory Coast (Lohier).

Ivory Coast: Dimbroko (Le Moult).

38_7. Var. **mundum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 127 (☿).

Type locality: Kakoulima, French Guinea (F. Silvestri).

38_8. Var. **nigriventre** (Stitz) Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 126 (☿).

Tetramorium blochmanni var. *nigriventre* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 388 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p 366 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 393 (☿).

Type locality: Misahöhe, Togo (Smend).

French Guinea: Konakry; Kakoulima (F. Silvestri). French Congo: Fort de Possel to Fort Crampel; Fort Crampel (Schubotz). Belgian Congo: Kassenje, western shore of Lake Albert (Schubotz). Nigeria: Ibadan (F. Silvestri).

38_9. Var. **vascoi** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 123 and 128 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

38*a*. Subsp. **cinnamomeum** "Arnold" Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 124 (☿).

Type locality: Rhodesia.

I have not found a form of *Tetramorium* described under the name "*cinnamomeum*" by Arnold.

38*b*. Subsp. **continentis** (Forel) Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 130 (☿). See p. 191.

Tetramorium blochmanni Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 36. Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 19 (☿, ♀, ♂).

Tetramorium blochmanni subsp. *continentis* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 426 (☿); 1913, ibid., LVII, p. 118 (☿, ♀); 1913, Rev. Zool. Afr., II,

p. 319 (☿). Bequaert, ibid., p. 424. Arnold, 1917, Ann. South African Mus., XIV, p. 278 (☿, ♀, ♂). Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 396.

Type locality: Natal (R. C. Wroughton; Haviland).

Bechuanaland: Kang to Kgokong; Severelela (L. Schultze). German Southwest Africa: Kubub (L. Schultze). Transvaal: Hamman's Kraal; Hebron (E. Simon). Natal: (Weitzecker). Basutoland: (Weitzecker). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). Rhodesia: Bulawayo (G. Arnold). Belgian Congo: Elisabethville; Sankisia (J. Bequaert); Zambi (Lang, Chapin and Bequaert).

38b_1. Var. **georgei** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 131 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

38b_2. Var. **platonis** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 130 (☿).

Type locality: Basutoland (R. C. Wroughton).

38*c*. Subsp. **femoratum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 37 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 294 (☿). Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 128 (☿).

Type locality: Makapan, Transvaal (E. Simon).

38c_1. Var. **collutum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 129 (☿).

Type locality: Durban, Natal (Demarchi).

38c_2. Var. **transversum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 128 (☿).

Type locality: Pretoria, Transvaal (C. U. Brain).

38*d*. Subsp. **inversum** Forel, 1916, Rev. Suisse Zool., XXIV, p. 421 (☿). Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 129 (☿).

Tetramorium sericeiventre var. *inversa* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 384 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

French Congo: M'Pila (A. Weiss). Belgian Congo: St. Gabriel (Kohl).

38d_1. Var. **defrictum** Santschi, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, pp. 124 and 129 (☿).

Type locality: Malindi, Rhodesia (G. Arnold).

Natal: Durban. Basutoland.

38*e*. Subsp. **petersi** (Forel).

Tetramorium blochmanni subsp. *petersi* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 19 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 280 (☿).

Type locality: Okahandja, German Southwest Africa (Peters).

39. **Tetramorium setigerum** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 22 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 424 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 287 (☿, ♀, ♂).

Type locality: Bothaville, Orange Free State (H. Brauns).

Natal: (R. C. Wroughton; Standfuss).

39*a*. Subsp. **quærens** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 226 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 289 (☿). See p. 193.

Type locality: Bulawayo, Rhodesia (G. Arnold).

Natal: Durban (Marley). Belgian Congo: Niapu (Lang and Chapin).

40. **Tetramorium setuliferum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 36 (☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 19 (☿, ♀); 1913, Ann. Soc. Ent. Belgique, LVII, p. 118 (☿). Arnold, 1913, Proc. Rhodesia Sc. Assoc., XII, p. 14; 1917, Ann. South African Mus., XIV, p. 289 (☿, ♀, ♂), Pl. vii, figs. 101, 101a.

Tetramorium squamiferum Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 80 (☿) (without description); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (☿) (without description).

Type locality: Vrijburg, Cape Province (E. Simon).

North West Rhodesia: Mwengwa (H. Dollman, in Coll. Wheeler). Southern Rhodesia: Bulawayo (G. Arnold). Basutoland: (Weitzecker). Cape Province: Mafeking. Delagoa: (Liengme). Orange Free State: (Weitzecker); Bothaville (H. Brauns). Bechuanaland: Khakhea; Severelela; Kooa to Sekgoma (L. Schultze). German Southwest Africa: Gobabis (Gentz). Natal: (R. C. Wroughton).

Specimens collected in Natal by Wroughton and received from Forel as "*T. squamiferum* Emery *in litt.*" agree entirely with Emery's description of *T. setuliferum*.

40_1. Var. **cucalense** Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 356 (☿).

Type locality: Cucala near Caconda, Benguela (J. Cruchet).

40_2. Var. **triptolemum** Arnold, 1917, Ann. South African Mus., XIV, p. 292 (☿).

Type locality: not mentioned, probably Rhodesia (G. Arnold).

40a. Subsp. **cluna** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 218 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 292 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

40*b*. Subsp. **galoasanum** Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 356.

Tetramorium setuliferum var. *galoasana* Santschi, 1910, ibid., LXXVIII, (1909), p. 381 (☿, ♀, ♂).

Type locality: Brazzaville, French Congo (A. Weiss).

French Congo: M'Boumion; Mindouga; Comba-Ibre (A. Weiss).

41. **Tetramorium simillimum** (F. Smith) Mayr, 1861, 'Europ. Formicid.,' p. 61 (☿); 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 456; 1870, ibid., XX, p. 972 (☿). Ern. André, 1874, Rev. Mag. Zool., (3) II, p. 191; 1881, Ann. Soc. Ent. France, (6) VII, p. 71 (☿, ♀). Forel, 1881, Mitth. München. Ent. Ver., V, p. 3. Ern. André, 1883, 'Spec. Hym. Europ. Algérie,' II, pp. 287, 289, 290 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 134. Mayr, in Jagerskiöld, 1903, 'Exped., IX, Formicid.,' p. 7. Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 422; 1907, Ann. Mus. Nat. Hungarici, V, p. 13 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 8 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 225. Emery, 1909, Deutsch. Ent. Zeitschr., p. 696 (☿, ♀, ♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 421 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 326 (☿, ♀, ♂). Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 136. See pp. 193 and 1030.

Myrmica simillima F. Smith, 1851, 'List Brit. Anim. Brit. Mus., VI, Aculeat.,' p. 118 (☿). Curtis, 1854, Trans. Linn. Soc. London, XXI, p. 216 (☿). F. Smith, 1855, Trans. Ent. Soc. London, (2) III, p. 129 (☿).

Tetrogmus caldarius Roger, 1857, Berlin. Ent. Zeitschr., I, p. 12 (☿, ♀); 1861, ibid., V, p. 172 (♂); 1862, ibid., VI, p. 297.

Myrmica (Leptothorax) simillima F. Smith, 1858, 'Cat. Brit. Fossor. Hym.,' p. 31 (☿).

Myrmica caldaria Meinert, 1860, Danske Vidensk. Selsk. Skrift., naturv. math. Afd., (5) V, p. 334 (☿, ♀, ♂).

Tetrogmus simillimus Roger, 1863, 'Verzeich. Formicid.,' p. 27.

Leptothorax simillimus White, 1883, 'Ants and Their Ways,' p. 266.

Tetramorium (Tetrogmus) simillimum Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 106 (☿).

Type locality: Dorsetshire, England, in a hothouse (Dale).

Tropicopolitan. Cameroon: Soppo (v. Rothkirch). Belgian Congo: St. Gabriel (H. Kohl); Stanleyville (Lang and Chapin). German East Africa: Kibosho (Katona). British East Africa: Shimoni (Alluaud and Jeannel). Egypt: Ismailia (Biró). Anglo-Egyptian Sudan: White Nile, south of Ondurman (I. Trägårdh); Khartum (Karawaiew). Natal: Durban (G. Arnold).

41_1. Var. **poweri** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 225 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 328 (☿).

Type locality: Kimberley, Cape Province (Power).

41_2. Var. **shilohense** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 218 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 329 (☿).

Type locality: Shiloh, Southern Rhodesia (G. Arnold).

Rhodesia: Bembesi (G. Arnold).

41a. Subsp. **bothæ** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 425 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 331 (☿, ♀, ♂).

Type locality: Basutoland (R. C. Wroughton; Haviland).

Natal: (R. C. Wroughton).

41*b*. Subsp. **delagoense** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 80 (☿, ♀, ♂); 1910, Ann. Soc. Ent. Belgique, LIV, p. 425. Arnold, 1917, Ann. South African Mus., XIV, p. 330 (☿, ♀, ♂).

Type locality: Delagoa (Liengme).

Natal: (R. C. Wroughton).

41*c*. Subsp. **isipingense** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 225 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 329 (☿).

Type locality: Isipingo, Natal (Marley).

$41c_1$. Var. **dumezi** Forel, 1916, Rev. Suisse Zool., XXIV, p. 422 (☿). See p. 193.

Type locality: St. Gabriel, Belgian Congo (H. Kohl).

Belgian Congo: Thysville (J. Bequaert).

42. **Tetramorium simoni** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 36 (☿), Pl. II, fig. 22. Arnold, 1917, Ann. South African Mus., XIV, p. 295 (☿).

Type locality: Makapan, Transvaal (E. Simon).

43. **Tetramorium simulator** Arnold, 1917, Ann. South African Mus., XIV, p. 297 (☿), Pl. VII, fig. 102.

Type locality: Malindi, Southern Rhodesia (G. Arnold).

44. **Tetramorium solidum** Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 362 (☿, ♀), Pl. XVII, fig. 7. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 135. Dixey

and Longstaff, 1907, Trans. Ent. Soc. London, p. 333. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 19 (♀). Arnold, 1917, Ann. South African Mus., XIV, p. 292 (☿, ♀).

Type locality: Cape of Good Hope (L. Péringuey).

Cape Province: Steinkopf (L. Schultze). Natal: Ladysmith (Dixey and Longstaff).

44$_1$. Var. **signatum** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 35 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 118 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 293 (☿), Pl. vii, fig. 98.

Type locality: Matjesfontein, Cape Province (E. Simon).

Cape Province: Kimberley; Willowmore (H. Brauns).

44a. Subsp. **lugubre** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 425 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 293 (☿).

Type locality: Mossamedes (Picard).

44a$_1$. Var. **grootense** (Forel) Arnold, 1917, Ann. South African Mus., XIV, p. 294 (♀, ♂).

Tetramorium solidum var. *grootensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 118 (♀, ♂?).

Type locality: Willowmore, Cape Province (H. Brauns).

45. **Tetramorium squaminode** Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 356, fig. 2 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 102 (☿, ♀, ♂).

Type locality: Mt. Kilimanjaro, 3200–3800 m., German East Africa (Alluaud and Jeannel).

45a. Subsp. **do** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 224 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 314 (☿, ♀, ♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

45a$_1$. Var. **flaviceps** Arnold, 1917, Ann. South African Mus., XIV, p. 316 (☿).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

45a$_2$. Var. **mus** Arnold, 1917, Ann. South African Mus., XIV, p. 316 (☿).

Type locality: Hillside, Bulawayo, Rhodesia (G. Arnold).

46. **Tetramorium subcœcum** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 137 (☿).

Type locality: Toullo, Abyssinia (de Rothschild).

46$_1$. Var. **inscium** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 218 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 17 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 318 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

Rhodesia: Matoppo Hills (G. Arnold). Eritrea: Nefasit (F. Silvestri).

47. **Tetramorium termitobium** Emery, 1908, Ann. Soc. Ent. Belgique, LII, p. 186 (☿).

Type locality: Sankuru, Belgian Congo (Luja).

48. **Tetramorium tersum** Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 357, fig. 1 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 102 (☿).

Type locality: Naivasha, Rift Valley, British East Africa (C. Alluaud).

49. **Tetramorium titus** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 427 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 317 (☿).

Type locality: Mountains of Natal (R. C. Wroughton).

50. **Tetramorium trægaordhi** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 23 (☿, ♀). Arnold, 1917, Ann. South African Mus., XIV, p. 319 (☿, ♀).

Type locality: Stamford Hill, Natal (I. Trägårdh).

Decamorium Forel

Tetramorium subg. *Decamorium* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 121.

Genotype: *Tetramorium (Decamorium) decem* Forel, 1913.

1. **Decamorium decem** (Forel).

Tetramorium (Decamorium) decem Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 121 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 349 (☿, ♀, ♂), Pl. VIII, fig. 111.

Type locality: Redbank, Rhodesia (G. Arnold).

Southern Rhodesia: Nyamandhloru; Hillside, Bulawayo (G. Arnold); Hartley (H. B. Maufe).

1_1. Var. **ultor** (Forel).

Tetramorium (Decamorium) decem var. *ultor* Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 217 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 351 (☿).

Type locality: Shiloh, Southern Rhodesia (G. Arnold).

Xiphomyrmex Forel

Tetramorium subg. *Xiphomyrmex* Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 385.

Genotype: *Tetramorium (Xiphomyrmex) kelleri* Forel, 1887.

1. **Xiphomyrmex angulinodis** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 16, fig. 3a (☿). See p. 194.

Tetramorium (Xiphomyrmex) angulinode Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 385, fig. 12 (☿, ♀, ♂). Forel, 1911, Rev. Zool. Afr., I, p. 279 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: Leopoldville (Dubois); Congo da Lemba (R. Mayné); Medje; Irumu (Lang and Chapin). French Congo: Samkita (F. Faure).

1_1. Var. **chloe** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 17, fig. 3*c* (☿).

Type locality: Sawmills, Southern Rhodesia (G. Arnold).

1_2. Var. **daphnis** Santschi, 1920, Ann. Soc. Ent. Belgique, LX, p. 16, fig. 3*b* (☿, ♀).

Type locality: Hillside near Bulawayo, Rhodesia (G. Arnold).

2. **Xiphomyrmex edouardi** (Forel) Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 344 (♀).

Tetramorium (Xiphomyrmex) edouardi Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 82 (☿).

Type locality: Southern Abyssinia (Ilg).

Abyssinia: (Reichensperger).

3. **Xiphomyrmex escherichi** (Forel) Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Tetramorium (Xiphomyrmex) escherichi Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 259 (☿, ♀).

Type locality: Ghinda, ERITREA (K. Escherich).

ERITREA: Nefasit (F. Silvestri).

4. **Xiphomyrmex fossulatus** (FOREL).

Tetramorium (Xiphomyrmex) fossulatum FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 428 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 348 (☿), Pl. VII, figs. 107, 109.

Type locality: Willbrook, NATAL (R. C. Wroughton).

5. **Xiphomyrmex humbloti** (FOREL). See p. 1031.

5_1. Var. **pembensis** (FOREL).

Tetramorium (Xiphomyrmex) humblotii var. *pembensis* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika (1903–05),' II, p. 83 (♀, ♂); 1907, Ann. Mus. Nat. Hungarici, V, p. 13 (☿, ♀); 1913, Ann. Soc. Ent. Belgique, LVII, p. 120 (☿). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 106 (☿).

Type locality: Fundu Island, W. Pemba, BRITISH EAST AFRICA (Voeltzkow).

GERMAN EAST AFRICA: Moshi; Arusha-chini; Boma Gombe (Katona). BRITISH EAST AFRICA: Mombasa (Alluaud and Jeannel).

5_2. Var. **victoriensis** (FOREL).

Tetramorium (Xiphomyrmex) humblotii var. *victoriensis* FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 120 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 346 (☿, ♀, ♂).

Type locality: Victoria Falls, RHODESIA (G. Arnold).

6. **Xiphomyrmex kivuensis** (STITZ).

Tetramorium (Xiphomyrmex) kivuense STITZ, 1911, 'Wiss. Ergebn. Deutsch. Zentral. Afr. Exp. (1907–08),' III, p. 386, fig. 6 (☿). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 106 (☿).

Type locality: Kwidjwi Island in Lake Kivu, BELGIAN CONGO (Schubotz).

BRITISH EAST AFRICA: Naivasha, Rift Valley, 1900 m. (Alluaud and Jeannel).

7. **Xiphomyrmex minusculus** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 369, fig. 32 (☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

8. **Xiphomyrmex muralti** (FOREL) SANTSCHI, 1919, Rev. Zool. Afr., VII, p. 88.

Tetramorium (Xiphomyrmex) muralti FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 429 (☿).

Type locality: CAMEROON (L. v. Muralt).

BELGIAN CONGO: Penge (J. Bequaert).

8_1. Var. **trilineatus** SANTSCHI, 1919, Rev. Zool. Afr., VII, p. 88 (☿, ♀).

Xiphomyrmex muralti SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 368 (☿, ♀).

Type locality: Aburi, GOLD COAST (F. Silvestri).

8a. Subsp. **flavithorax** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 369, fig. 31 (☿).

Type locality: Aburi, GOLD COAST (F. Silvestri).

9. **Xiphomyrmex occidentalis** SANTSCHI, 1916, Bull. Soc. Ent. France, p. 50, fig. 1 (☿).

Type locality: CAMEROON.

9a. Subsp. **akengensis** WM. M. WHEELER. See p. 194 (☿, ♀).

Type locality: Akenge, BELGIAN CONGO (Lang and Chapin).

LIBERIA.

10. **Xiphomyrmex orbiceps** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 367, fig. 30 (☿).

Type locality: Victoria, CAMEROON (F. Silvestri).

GOLD COAST: Aburi (F. Silvestri).

11. **Xiphomyrmex weitzeckeri** (EMERY).

Tetramorium (*Xiphomyrmex*) *weitzeckeri* EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 39 (☿). WASMANN, 1911, Tijdschr. v. Ent., LIV, p. 201. REICHENSPERGER, 1915, Med. Göteborgs Mus. Zool. Afd., V, pp. 40 and 73.

Tetramorium (*Xiphomyrmex*) *weitzaeckeri* FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 428 (☿).

Tetramorium (*Xiphomyrmex*) *weitzaeckeri* FOREL, 1913, Rev. Zool. Afr., II, p. 319 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 345 (☿, ♀).

Tetramorium weitzaeckeri BEQUAERT, 1913, Rev. Zool. Afr., II, p. 425.

Tetramorium (*Xiphomyrmex*) *weitzekeri* SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 24 (☿).

Type locality: Verulam, NATAL (Weitzecker).

BELGIAN CONGO: Elisabethville (J. Bequaert). RHODESIA: Victoria Falls (R. C. Wroughton); Redbank; Bulawayo; Hope Fountain (G. Arnold). NATAL: (Haviland); Durban; Stamford Hill (I. Trägårdh).

Tetramyrma FOREL

Dilobocondyla subg. *Tetramyrma* FOREL, 1912, Rev. Suisse Zool., XX, p. 766.

Tetramyrma FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 122; 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 245. ARNOLD, 1917, Ann. South African Mus., XIV, p. 358.

Genotype: *Dilobocondyla* (*Tetramyrma*) *braunsi* Forel, 1912.

1. **Tetramyrma braunsi** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 122 (♀ ergat., ☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 358 (☿, ♀), Pl. VII, fig. 86.

Dilobocondyla (*Tetramyrma*) *braunsi* FOREL, 1912, Rev. Suisse Zool., XX, p. 767 (☿).

Type locality: Willowmore, CAPE PROVINCE (H. Brauns).

Rhoptromyrmex MAYR

Rhoptromyrmex MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 18.

Genotype: *Rhoptromyrmex globulinodis* Mayr, 1901.

1. **Rhoptromyrmex arnoldi** SANTSCHI, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 503 (☿); 1917, ibid., LXXXV, (1916), p. 286.

Type locality: Victoria Falls, RHODESIA (G. Arnold).

2. **Rhoptromyrmex globulinodis** MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 20 (☿, ♀, ♂). ARNOLD, 1917, Ann. South African Mus., XIV, p. 352 (☿, ♀, ♂).

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

2a. Subsp. **alberti** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 419 (☿).

Type locality: BELGIAN CONGO (Kohl).

3. **Rhoptromyrmex opacus** FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 59, footnote (☿). EMERY, ibid., p. 133. FOREL, 1916, Rev. Suisse Zool., XXIV, p. 419 (☿). See p. 195.

Type locality: CAMEROON (Conradt).

BELGIAN CONGO: (Kohl); Thysville (J. Bequaert).

3_1. Var. **estus** FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 59 (☿, ♀, ♂).
Type locality: LOWER CONGO, in stomach of *Manis temmincki* (Solon).

3_2. Var. **læviceps** SANTSCHI, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 504 (☿).
Type locality: Boma, BELGIAN CONGO.

4. **Rhoptromyrmex solleri** FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 430 (♀).
Type locality: Bissao, PORTUGUESE GUINEA (Soller).

5. **Rhoptromyrmex steini** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 122 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 357 (☿).
Type locality: Ladismith, CAPE PROVINCE (H. Brauns).

6. **Rhoptromyrmex tessmanni** FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, 421 (☿).
Type locality: Alen, SPANISH GUINEA (Tessmann).

7. **Rhoptromyrmex transversinodis** MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 22 (☿). BERGROTH, 1903, Wien. Ent. Zeitg., XXII, p. 254. ARNOLD, 1917, Ann. South African Mus., XIV, p. 355 (☿, ♀), Pl. VIII, figs. 112, 112a, 113, 113a.
Rhoplaomyrmex transversinodis "MAYR" WASMANN, 1898, Wien. Ent. Zeitg., XVII, p. 99 (without description).
Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).
ORANGE FREE STATE: Bothaville (H. Brauns). TRANSVAAL: Pretoria (C. U. Brain).

Triglyphothrix FOREL

Triglyphothrix FOREL, 1890, Ann. Soc. Ent. Belgique, XXXIV, C. R., p. cvi.
Genotype: *Triglyphothrix walshi* Forel, 1890.

1. **Triglyphothrix areolatus** STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 142, fig. 9 (☿).
Type locality: Bibundi, CAMEROON (Tessmann).

2. **Triglyphothrix auropunctatus** FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 20 (☿, ♀).
Tetramorium (Triglyphothrix) auropunctatus ARNOLD, 1917, Ann. South African Mus., XIV, p. 334 (☿, ♀).
Type locality: NATAL, 2500 m. (Haviland).

2_1. Var. **bulawayensis** (ARNOLD).
Tetramorium (Triglyphothrix) auropunctatus var. *bulawayensis* ARNOLD, 1917, Ann. South African Mus., XIV, p. 335 (☿).
Type locality: Bulawayo, SOUTHERN RHODESIA (G. Arnold).

2_2. Var. **fusciventris** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 116 (☿).
Tetramorium (Triglyphothrix) auropunctatus var. *fusciventris* ARNOLD, 1917, Ann. South African Mus., XIV, p. 336 (☿).
Type locality: Bulawayo, SOUTHERN RHODESIA (G. Arnold).

2_3. Var **pallens** FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 424 (☿); 1911, Deutsch. Ent. Zeitschr., p. 311 (☿).
Tetramorium (Triglyphothrix) auropunctatus var *pallens* ARNOLD, 1917, Ann. South African Mus., XIV, p. 336 (☿).
Type locality: NATAL (Haviland).

2_4. Var **rhodesianus** FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 221 (♀).

Tetramorium (Triglyphothrix) auropunctatus var. *rhodesiana* Arnold, 1917, Ann. South African Mus., XIV, p. 336 (♀).

Type locality: Bembesi, Southern Rhodesia (G. Arnold).

3. **Triglyphothrix constanciæ** (Arnold).

Tetramorium (Triglyphothrix) constanciæ Arnold, 1917, Ann. South African Mus., XIV, p. 339 (☿), Pl. vii, figs. 94, 94a.

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

4. **Triglyphothrix desertorum** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 20 (♀, ♂).

Tetramorium (Triglyphothrix) desertorum Arnold, 1917, Ann. South African Mus., XIV, p. 344 (♀, ♂).

Type locality: Kgokong to Kang, Bechuanaland (L. Schultze).

5. **Triglyphothrix emini** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 79 (☿).

Type locality: Southern Abyssinia (Ilg).

6. **Triglyphothrix gabonensis** Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 53 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 135. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿). Forel, 1913, Rev. Suisse Zool., XXI, p. 668 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 393 (♀, ♂). See p. 197.

Type locality: Gaboon, French Congo.

Cameroon: Mundame (Conradt). Belgian Congo: Angu; Libenge; Mongumba, on the Ubangi River (Schubotz); Akenge; Niapu; Ngayu; Medje (Lang and Chapin).

6_1. Var. **boulognei** Forel, 1916, Rev. Suisse Zool., XXIV, p. 423 (☿).

Type locality: Belgian Congo (H. Kohl).

6_2. Var. **brevispinosus** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 144 (☿).

Type locality: Bismarckburg, Togo (Conradt).

6a. Subsp. **soyauxi** Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 53 (♀).

Type locality: Sibange, French Congo (Soyaux).

7. **Triglyphothrix hepburni** (Arnold).

Tetramorium (Triglyphothrix) hepburni Arnold, 1917, Ann. South African Mus., XIV, p. 340 (☿, ♀, ♂).

Type locality: Hillside, Bulawayo, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Matoppo Hills (G. Arnold).

8. **Triglyphothrix imbellis** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 18, fig. 9 (☿).

Type locality: Nefasit, Eritrea (F. Silvestri).

9. **Triglyphothrix inezulæ** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 221 (☿, ♂).

Tetramorium (Triglyphothrix) inezulæ Arnold, 1917, Ann. South African Mus., XIV, p. 343 (☿, ♂).

Type locality: Beach Bush, Durban, Natal (G. Arnold).

10. **Triglyphothrix marleyi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 221 (☿).

Tetramorium (Triglyphothrix) marleyi Arnold, 1917, Ann. South African Mus., XIV, p. 342 (☿).

Type locality: Krantzkloof, Natal (Marley).

Natal: Durban (Marley).

11. **Triglyphothrix marthæ** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 265 (☿).

Type locality: Zanzibar.

12. **Triglyphothrix microps** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 25 (☿, ♀).

Tetramorium (Triglyphothrix) microps Arnold, 1917, Ann. South African Mus., XIV, p. 337 (☿, ♀).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

13. **Triglyphothrix mucidus** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 71 (☿). See p. 197.

Type locality: Sankuru, Belgian Congo (Luja).

Belgian Congo: Medje; Ngayu; Boyulu (Lang and Chapin).

14. **Triglyphothrix pauper** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 286 (☿).

Type locality: Umgusa River, Cawston Farm, Southern Rhodesia (G. Arnold).

15. **Triglyphothrix rothschildi** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 134 (☿).

Type locality: Harar, Abyssinia (de Rothschild).

16. **Triglyphothrix silvestrii** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 17, fig. 8 (☿).

Type locality: Nefasit, Eritrea (F. Silvestri).

17. **Triglyphothrix striatidens** (Emery) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 136. Forel, 1900, Mitth. Schweiz. Ent. Ges., X, p. 284 (☿); 1901, Mitt. Zool. Mus. Berlin, II, p. 10; 1903, Journ. Bombay Nat. Hist. Soc., XIV, p. 704. Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 173; 1906, Bull. Misc. Inform. Bot. Gard. Kew, Add. Ser. V, p. 28. Donisthorpe, 1908, ibid., p. 122. Wm. M. Wheeler, 1909, Bull. American Mus. Nat. Hist., XXVI, p. 336. Donisthorpe, 1915, 'British Ants,' p. 341. Forel, 1911, '1^er^ Congr. Intern. Entom. Bruxelles (1910),' II, Mém., p. 83; 1912, Mém. Soc. Ent. Belgique, XX, p. 1; 1913, Zool. Jahrb. Abt. Syst., XXXVI, p. 82. Wm. M. Wheeler, 1916, Journ. Econ. Ent., IX, pp. 566–569, fig. 39 (☿). See p. 1032.

Tetramorium obesum subsp. *striatidens* Emery, 1889, Ann. Mus. Civ. Genova, XXVII, p. 501 (☿).

Triglyphothrix obesus subsp. *striatidens* Emery, 1891, 'Explor. Tunisie, Fourmis,' p. 4.

Type locality: Bhamo, Burma (L. Fea).

This Indian ant is becoming tropicopolitan. Tunis. Sierra Leone.

18. **Triglyphothrix trimeni** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 40 (☿, ♀). Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 13 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 107 (♀).

Tetramorium (Triglyphothrix) trimeni Arnold, 1917, Ann. South African Mus., XIV, p. 337 (☿, ♀).

Type locality: Kimberley, Cape Province (E. Simon).

German East Africa: Kibosho; Mto-ya-Kifaru (Katona); New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). Transvaal: Hamman's Kraal (E. Simon).

Ochetomyrmicini Emery

Wasmannia FOREL

Wasmannia FOREL, 1893, Trans. Ent. Soc. London, p. 383.

Type: *Tetramorium* (?) *auropunctatum* Roger, 1863.

1. **Wasmannia auropunctata** (ROGER) FOREL, 1893, Trans. Ent. Soc. London, p. 383 (☿, ♀, ♂).

Tetramorium (?) *auropunctatum* ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 182 (☿).

Xiphomyrmex atomum SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 370 (☿).

Wasmannia auropunctata var. *atoma* SANTSCHI, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 504 (☿).

Type locality: CUBA (Gundlach).

Neotropical. FRENCH CONGO: Libreville (F. Silvestri); evidently introduced from South America.

Cataulacini Emery

Cataulacus F. SMITH

Cataulacus F. SMITH, 1854, Trans. Ent. Soc. London, (2) II, p. 225.

Cryptocerus (part) LEPELETIER. *Formica* (part) LATREILLE.

Genotype: *Cataulacus taprobanæ* F. Smith, 1854.

1. **Cataulacus baumi** FOREL, 1901, Mitth. Schweiz. Ent. Ges., X, p. 304 (☿, ♀, ♂); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 560 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 388 (☿, ♀, ♂).

Type locality: between the Cubango and Cuito Rivers, MOSSAMEDES (Baum and Van der Kellen).

1a. Subsp. **batonga** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 114 (☿). ARNOLD, 1920, Ann. South African Mus., XIV, p. 404 (☿).

Cataulacus baumi var. *batonga* ARNOLD, 1917, ibid., XIV, p. 389 (☿), Pl. VIII, figs. 119 and 119a.

Type locality: RHODESIA (G. Arnold).

1a. Var. **bulawayensis** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 218 (☿, ♀). ARNOLD, 1920, Ann. South African Mus., XIV, p. 404 (☿).

Cataulacus baumi var. *bulawayensis* ARNOLD, 1917, ibid., XIV, p. 391 (☿, ♀).

Type locality: Bulawayo, SOUTHERN RHODESIA (G. Arnold).

2. **Cataulacus bequaerti** FOREL, 1913, Rev. Zool. Afr., II, p. 316 (☿). BEQUAERT, ibid., p. 424.

Type locality: Village Kabanza on the River Lovoi near Kikondja, BELGIAN CONGO (J. Bequaert).

3. **Cataulacus coriaceus** STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 138, fig. 7 (☿).

Type locality: Mundame, CAMEROON (Conradt).

4. **Cataulacus egenus** SANTSCHI, 1910, Ann. Soc. Ent. France, LXXIX, p. 359, fig. (☿). See p. 199 (☿, ♀).

Type locality: Madingu, FRENCH CONGO (P. Zimmermann).

BELGIAN CONGO: Medje (Lang and Chapin).

4a. Subsp. **simplex** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 111, fig. 18 (☿).

Type locality: Central Uganda (C. Alluaud).

5. **Cataulacus erinaceus** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 134, fig. 3 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 315 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (♀); 1913, Rev. Suisse Zool., XXI, p. 668 (☿); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 345 (☿); 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀). See p. 198.

Cataulacus princeps "Emery" Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 71 (☿), without description.

Type locality: Alen, Spanish Guinea (Tessmann).

Cameroon: Mundame (Conradt). Belgian Congo: Kondué, Kasai; Sankuru (Luja); Batiamponde (H. Kohl); Stanleyville; Risimu (Lang and Chapin).

5_1. Var. **crassispina** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 287 (☿).

Type locality: Goda, French Congo (P. Chaleuf).

6. **Cataulacus foveolatus** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 140 (☿).

Type locality: Uelleberg, Spanish Guinea (Tessmann).

7. **Cataulacus guineensis** F. Smith, 1854, Trans. Ent. Soc. London, (2) II, p. 225 (☿), Pl. xx, fig. 5; 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 196; 1862, Trans. Ent. Soc. London, (3) I, p. 414 (☿). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 403. Roger, 1863, 'Verzeich. Formicid.,' p. 39. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 138. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 4 (☿). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 129. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 390 (☿, ♀). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 263 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 373 (☿, ♀). Forel, 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀). See p. 199.

Type locality: Tropical West Africa.

Liberia: Junk River (H. Brauns). Dahomey: Kotonou (F. Silvestri). Southern Nigeria: Lagos (F. Silvestri); Old Calabar (Bates). French Congo: Ogowe (Mocquerys); Brazzaville (A. Weiss). Belgian Congo: Malomé on the Okiavo (Kohl); Leopoldville to Yumbi; Bolobo; Lukolela to Basoko; Isangi; Stanleyville; Medje; Akenge (Lang and Chapin).

7_1. Var. **alenensis** (Stitz) Forel, 1913, Rev. Suisse Zool., XXI, p. 668 (☿).

Cataulacus sulcatus var. *alenensis* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 137 (☿).

Type locality: Alen, Spanish Guinea (Tessmann).

Cameroon: (Conradt).

7_2. Var. **fernandensis** (Stitz).

Cataulacus sulcatus var. *fernandensis* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 137 (☿).

Type locality: Fernando Po (Zenker).

7_3. Var. **sulcatus** (Stitz) Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 263 (☿).

Cataulacus sulcatus Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 136, figs. 4–6 (☿, ♀, ♂).

Cataulacus guineensis Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 421.

Type locality: Yaunde, Cameroon (Zenker).

Southern Nigeria: Old Calabar (Bates).

7a. Subsp. **sulcinodis** Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 563 (☿), Pl. xv, fig. 8.

Cataulacus sulcinodis Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 139.

Type locality: Assinie, Ivory Coast (C. Alluaud).

8. **Cataulacus hararicus** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 79 (☿). Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 180 (☿).

Type locality: Harar, Southern Abyssinia (Ilg).

Somaliland: Lower Ganale (V. Bottego).

9. **Cataulacus huberi** Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 326 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 138. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 128 (☿). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 4 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 390 (☿).

Type locality: Sierra Leone (Mocquerys).

French Congo: Ubangi (Dybowski); Ogowe (Mocquerys).

9_1. Var. **longispinus** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 139, fig. 8 (☿).

Type locality: Mundame, Cameroon (Conradt).

9a. Subsp. **herteri** Forel, 1913, Rev. Zool. Afr., II, p. 315 (☿). Bequaert, ibid., p. 423.

Type locality: Welgelegen, Belgian Congo (J. Bequaert).

10. **Cataulacus intrudens** (F. Smith) Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 364. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 138. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 78. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 41 (☿, ♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 129 (♀); in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 14. Sjöstedt, 1908, ibid., p. 117. Arnold, 1917, Ann. South African Mus., XIV, p. 391 (☿, ♀, ♂).

Meranoplus intrudens F. Smith, 1876, Trans. Ent. Soc. London, p. 609 (☿, ♀, ♂), Pl. xi, figs. 7 and 7*a*. Emery, 1892, Zool. Anzeiger, XV, p. 237.

Type locality: Weenen District, Natal, in thorns of *Acacia* (J. M. Hutchinson).

Delagoa: (Liengme). Transvaal: Hamman's Kraal (E. Simon). German East Africa: Mombo, Usambara (Sjöstedt).

10a. Subsp. **intermedius** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 287 (☿).

Cataulacus intrudens var. *intermedius* Arnold, 1920, Ann. South African Mus., XIV, pp. 403 and 404 (☿).

Type locality: Bembesi, Rhodesia (G. Arnold).

10*b*. Subsp. **tristiculus** Santschi, 1919, Rev. Zool. Afr., VI, p. 237 (☿).

Type locality: Port Elizabeth, Cape Province (T. Reeve).

11. **Cataulacus kohli** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 127, fig. 2 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 389, fig. 14 (☿, ♂).

Type locality: Samlia Falls, N'Gamie River, Sierra Leone.

French Congo: Brazzaville (A. Weiss).

11a. Subsp. **brazzavillensis** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 389, fig. 15 (☿, ♂).

Type locality: Brazzaville, French Congo (A. Weiss).

12. **Cataulacus lobatus** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 126, fig. 1 (☿).

Type locality: Warship harbor in Cameroon (H. Brauns).

13. **Cataulacus marleyi** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 219 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 398 (☿, ♀); 1920, ibid., XIV, p. 404 (☿).

Type locality: Krantz Kloof, NATAL (Marley).

NATAL: Durban (Marley).

14. **Cataulacus micans** (MAYR) FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 219. ARNOLD, 1917, Ann. South African Mus., XIV, p. 393 (☿, ♀, ♂).

Cataulacus rugosus subsp. *micans* MAYR, 1901, Ann. Naturh. Hofmus. Wien, X, p. 27 (☿, ♀, ♂).

Type locality: Port Elizabeth, CAPE PROVINCE (H. Brauns).

14a. Subsp. **durbanensis** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 219 (☿). ARNOLD, 1917, Ann. South African Mus., XIV, p. 394 (☿, ♀, ♂); 1920, ibid., XIV, p. 404 (☿).

Type locality: Durban, NATAL (G. Arnold).

15. **Cataulacus mocquerysi** ERN. ANDRÉ, 1889, Rev. d'Ent. Caen, VIII, p. 229 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 138.

Type locality: SIERRA LEONE (Mocquerys).

15_1. Var. **nainei** FOREL, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LI, (1917), p. 724 (☿).

Type locality: BELGIAN CONGO (Kohl).

16. **Cataulacus otii** (FOREL).

Cataulacus wissmanni subsp. *otii* FOREL, 1901, Mitth. Schweiz. Ent. Ges., X, p. 304 (☿).

Type locality: Durban, NATAL (Haviland).

16a. Subsp. **fricatidorsus** SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 26 (☿). TRÄGÅRDH, ibid., p. 45. ARNOLD, 1917, Ann. South African Mus., XIV, p. 401 (☿).

Type locality: Dukudu, ZULULAND (I. Trägårdh).

17. **Cataulacus parallelus** F. SMITH, 1854, Trans. Ent. Soc. London, (2) II, p. 226 (♀), Pl. XIX, fig. 6; 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 196; 1862, Trans. Ent. Soc London, (3) I, p. 414 (♀). MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 403. ROGER, 1863, 'Verzeich. Formicid.,' p. 39. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 138. ARNOLD, 1917, Ann. South African Mus., XIV, p. 402 (♀).

Type locality: Cape of Good Hope.

18. **Cataulacus pilosus** SANTSCHI, 1920, Rev. Zool. Afr., VIII, p. 118 (☿, ♀).

Type locality: Avakubi, BELGIAN CONGO (J. Bequaert).

19. **Cataulacus pullus** SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 387, fig. 13 (☿).

Type locality: Brazzaville, FRENCH CONGO (A. Weiss).

19_1. Var. **orientalis** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 108 (☿).

Type locality: Voi, 600 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

20. **Cataulacus pygmæus** ERN. ANDRÉ, 1890, Rev. d'Ent. Caen, IX, p. 325 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 139. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 390 (☿).

Type locality: SIERRA LEONE (Mocquerys).

FRENCH CONGO: Brazzaville (A. Weiss).

20_1. Var. **bakusuensis** FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 350 (♀, ♂).

Type locality: Bakusu, BELGIAN CONGO.

20_2. Var. **chariensis** SANTSCHI, 1910, Ann. Soc. Ent. France, LXXIX, p. 358 (☿).

Type locality: Fort Archambault, MOYEN CHARI (Decorse).

20*a*. Subsp. **brevisetosus** (Forel) Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, p. 508.

Cataulacus brevisetosus Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 305 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 560 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

20*b*. Subsp. **degener** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 507 (☿).

Type locality: not given.

20*c*. Subsp. **difficilis** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 506 (☿).

Type locality: Dahomey (Desanti).

20*d*. Subsp. **jeanneli** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), pp. 506, footnote, and 508.

Cataulacus jeanneli Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 108, fig. 16 (☿).

Type locality: Gazi near Mombasa, British East Africa (Alluaud and Jeannel).

20*e*. Subsp. **lujæ** (Forel) Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), pp. 506, footnote, and 508. See p. 199.

Cataulacus lujæ Forel, 1911, Deutsch. Ent. Zeitschr., p. 311 (☿); 1913, Rev. Zool. Afr., II, p. 316 (♀).

Cataulacus brevisetosus subsp. *lujæ* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 220 (♀, ♂); 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 397 (☿, ♀, ♂); 1917, ibid., XIV, p. 404 (☿).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: St. Gabriel (Kohl); Garamba (Lang and Chapin). Southern Rhodesia: Bulawayo (G. Arnold). Cape Province: Kimberley (Power).

20e_1. Var. **gilviventris** (Forel).

Cataulacus lujæ var. *gilviventris* Forel, 1913, Rev. Zool. Afr., II, p. 316 (♀). Bequaert, ibid., p. 423.

Type locality: Village Kabanza on the Lovoi River near Kikondja, Belgian Congo (J. Bequaert).

20e_2. Var. **plebejus** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 508 (☿).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

20e_3. Var. **weissi** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 508.

Cataulacus weissi Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 310 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀, ♂).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: St. Gabriel (Kohl).

21. **Cataulacus rugosus** (Forel) Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 129 (☿, ♀). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 43. Arnold, 1917, Ann. South African Mus., XIV, p. 392 (☿, ♀).

Cataulacus intrudens var. *rugosus* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 78 (☿).

Type locality: Delagoa Bay, Portuguese East Africa (A. Müller; Liengme).

German East Africa: Tanga (H. Brauns). Zanzibar: (H. Brauns).

21_1. Var. **subrugosus** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 26 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 393 (☿).

Type locality: Junction of the Umfolosi Rivers, Zululand (I. Trägårdh).

22. **Cataulacus schoutedeni** Santschi, 1919, Rev. Zool. Afr., VI, p. 248 (☿, ♀).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

23. **Cataulacus tardus** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 372, fig. 33 (☿).

Type locality: Mamou, French Guinea (F. Silvestri).

24. **Cataulacus trægaordhi** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 24, fig. 3 (☿, ♀, ♂). Arnold, 1917, Ann. South African Mus., XIV, p. 399 (☿, ♀, ♂).

Type locality: Dukudu, Zululand (I. Trägårdh).

Zululand: Umfolosi (I. Trägårdh).

24_1. Var. **plectroniæ** Wm. M. Wheeler. See p. 199 (☿).

Type locality: Stanleyville, Belgian Congo (Lang, Chapin and Bequaert).

24_2. Var. **ugandensis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 110 (☿).

Type locality: Unyoro Province, near Hoima, Central Uganda (C. Alluaud).

25. **Cataulacus wissmanni** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 78 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 401 (☿).

Type locality: Mozambique (A. Müller).

25a. Subsp. **linearis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 109, fig. 17 (☿).

Type locality: Voi, Wa-Taita, British East Africa (Alluaud and Jeannel).

British East Africa: Mbuyuni, Pori (Alluaud and Jeannel).

Dacetonini Emery

Microdaceton Santschi

Microdaceton Santschi, 1913, Bull. Soc. Ent. France, p. 478; 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 33.

Genotype: *Microdaceton exornatum* Santschi, 1913.

1. **Microdaceton exornatum** Santschi, 1913, Bull. Soc. Ent. France, p. 478 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 33, fig. 8 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 384 (☿).

Type locality: Dukudu, Zululand (I. Trågårdh).

Strumigenys F. Smith

Strumigenys F. Smith, 1860, Journ. of Entom., I, p. 72.

Labidogenys Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 249.

Pyramica Roger, ibid., p. 251.

Genotype: *Strumigenys mandibularis* F. Smith, 1860.

Subgenus 1. **Strumigenys** F. Smith, *sensu stricto*

Subgenotype: same as genotype

1. **Strumigenys arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 114 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 376 (☿), Pl. viii, figs. 117, 117a *d*. Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 143.

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

2. **Strumigenys havilandi** Forel, 1905, Mitt. Naturh. Mus. Hamburg, XXII, p. 13, footnote (☿). Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 377 (☿). Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 143.

Type locality: Natal, 5300 ft. (Haviland).

2a. Subsp. **marleyi** Arnold, 1914, Proc. Rhodesia Sc. Assoc., XIII, p. 31 (☿), Pl., fig. 10; 1917, Ann. South African Mus., XIV, p. 378 (☿).

Type locality: Durban, Natal (Marley).

3. **Strumigenys irrorata** Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿); 1914, Med. Goteborgs Mus. Zool. Afd., III, p. 29, fig. 5 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 375 (☿).

Type locality: Lake Sibayi, Zululand (I. Trägårdh).

4. **Strumigenys reticulata** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 141 (☿, ♀). Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿).

Type locality: Bibundi, Cameroon (Tessmann).

5. **Strumigenys rufobrunea** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 373 (☿, ♀).

Type locality: Konakry, French Guinea (F. Silvestri).

Nigeria: Olokemeji (F. Silvestri).

6. **Strumigenys stygia** Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 113, fig. 20 (☿). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, p. 366.

Type locality: Cave A at Shimoni, British East Africa (Alluaud and Jeannel).

7. **Strumigenys sulfurea** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 261 (☿).

Type locality: Samkita, French Congo (F. Faure).

8. **Strumigenys tragaordhi** Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿).

Strumigenys tragaordhi Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 28, fig. 4 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 374 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 19 (☿, ♀).

Type locality: Pietermaritzburg, Natal (I. Trägårdh).

Eritrea: Ghinda (F. Silvestri). Natal: Sweetwaters (I. Trägårdh).

Subgenus 2. **Cephaloxys** F. Smith

Cephaloxys F. Smith, 1865, Journ. Proc. Linn. Soc. London, Zool., VIII, p. 76.

Trichoscapa Emery, 1869, Ann. Accad. Natural. Napoli, (2) II, p. 24.

Strumigenys subg. *Cephaloxys* Emery, 1916, Bull. Soc. Ent. Italiana, XLVII, p. 204.

Subgenotype: *Cephaloxys capitata* F. Smith, 1865.

9. **Strumigenys (Cephaloxys) alluaudi** Santschi.

Strumigenys alluaudi Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 360 (☿, ♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 111 (☿, ♀). Alluaud and Jeannel, 1914, Arch. Zool. Gén. Exp., LIII, pp. 368 and 375.

Strumigenys (Trichoscapa) alluaudi Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Grotto of Tanga, "Kulumuzi," German East Africa (C. Alluaud).

9*a*. Subsp. **nigeriensis** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 376 (☿).

Type locality: Olokemeji, Nigeria (F. Silvestri).

10. **Strumigenys (Cephaloxys) biconvexa** Santschi.

Strumigenys (Trichoscapa) biconvexa Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Strumigenys biconvexa Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 111, fig. 19a (☿, ♀).

Type locality: Likoni, British East Africa (Alluaud and Jeannel).

11. **Strumigenys (Cephaloxys) concolor** Santschi.

Strumigenys (Trichoscapa) concolor Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 375 (☿, ♀).

Type locality: Aburi, Gold Coast (F. Silvestri).

12. **Strumigenys (Cephaloxys) emarginata** Mayr.

Strumigenys emarginata Mayr, 1901, Ann. Naturh. Hofmus. Wien, X, p. 26 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 379 (☿).

Strumigenys (Trichoscapa) emarginata Santschi, 1913, Bull. Soc. Ent. France, p. 257 (☿).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

13. **Strumigenys (Cephaloxys) escherichi** Forel.

Strumigenys escherichi Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 261 (☿).

Strumigenys (Trichoscapa) escherichi Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Ghinda, Eritrea (K. Escherich).

13$_1$. Var. **cliens** Forel, 1913, Rev. Zool. Afr., II, p. 317 (☿).

Strumigenys escherichi subsp. *cognata* var. *cliens* Bequaert, 1913, Rev. Zool. Afr., II, p. 424.

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

13*a*. Subsp. **boerorum** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 32 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 383 (☿, ♀).

Strumigenys (Trichoscapa) cognata subsp. *boerorum* Santschi, 1913, Bull. Soc. Ent. France, p. 259 (☿).

Type locality: Stamford Hill, Natal (I. Tragårdh).

Zululand: Dukudu (I. Tragårdh).

13*b*. Subsp. **cognata** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 376 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀, ♂). Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 144.

Strumigenys cognata Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 362 (☿, ♀); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 32, fig. 7 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 112, fig. 19*b* (☿).

Strumigenys (Trichoscapa) cognata Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

French Guinea: Kindia (F. Silvestri). Belgian Congo: (Kohl).

13*b*$_1$. Var. **fusciventris** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 261.

Strumigenys (Trichoscapa) escherichi subsp. *cognata* var. *obscuriventris* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 376 (☿).

Type locality: Olokemeji, Nigeria (F. Silvestri).

13*c*. Subsp. **limbata** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 222 (☿). Arnold, 1917, Ann. South African Mus., XIV, p. 381 (☿, ♀), Pl. VIII, fig. 118.

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Natal: Durban (Marley).

14. **Strumigenys (Cephaloxys) glanduscula** Santschi, 1919, Rev. Zool. Afr., VII, p. 88 (☿).

Type locality: Yambuya, Belgian Congo (J. Bequaert).

15. **Strumigenys (Cephaloxys) lujæ** Forel.

Strumigenys luja Forel, 1902, Allgem. Zeitschr. Ent., VII, p. 294, footnote (☿), Pl. I, fig. 1. Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 144.

Strumigenys (Trichoscapa) lujæ Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Morumballe, on the Zambesi (E. Luja).

16. **Strumigenys (Cephaloxys) maynei** Forel.

Strumigenys (Trichoscapa) maynei Forel, 1916, Rev. Suisse Zool., XXIV, p. 427 (☿, ♀, ♂). Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 143.

Type locality: Stanleyville, Belgian Congo (Kohl).

16_1. Var. **latiuscula** Forel, 1916, Rev. Suisse Zool., XXIV, p. 428 (☿, ♀).

Type locality: Belgian Congo (R. Mayné).

17. **Strumigenys (Cephaloxys) rothkirchi** Wasmann.

Strumigenys rothkirchi Wasmann, 1918, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VII, p. 142 (☿), Pl. II, figs. 9 and 10.

Type locality: Soppo, Cameroon (v. Rothkirch).

18. **Strumigenys (Cephaloxys) serrula** Santschi.

Strumigenys luja var. *serrula* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 390 (☿).

Strumigenys serrula Santschi, 1910, ibid., LXXIX, p. 361 (☿).

Strumigenys (Trichoscapa) serrula Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

19. **Strumigenys (Cephaloxys) simoni** Emery.

Strumigenys simoni Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 42 (☿), Pl. II, fig. 21. Arnold, 1917, Ann. South African Mus., XIV, p. 380 (☿).

Strumigenys (Trichoscapa) simoni Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿).

Type locality: Makapan, Transvaal (E. Simon).

20. **Strumigenys (Cephaloxys) transversa** Santschi.

Strumigenys (Trichoscapa) transversa Santschi, 1913, Bull. Soc. Ent. France, p. 258 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 31, fig. 6 (☿).

Strumigenys transversa Arnold, 1917, Ann. South African Mus., XIV, p. 380 (☿).

Type locality: Pietermaritzburg, Natal (I. Trägårdh).

Epitritus Emery

Epitritus Emery, 1869, Bull. Soc. Ent. Italiana, I, p. 136.

Genotype: *Epitritus argiolus* Emery, 1869.

1. **Epitritus mandibularis** Szabó, 1909, Archivum Zoologicum, Budapest, I, p. 1, fig. 2 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 34 (♀). Arnold, 1917, Ann. South African Mus., XIV, p. 385 (☿, ♀).

Type locality: Mto-ya-Kifaru, GERMAN EAST AFRICA (Katona).

NATAL: Stamford Hill (I. Trägårdh).

2. **Epitritus marginatus** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 114, fig. 21 (☿, ♀). ALLUAUD and JEANNEL, 1914, Arch. Zool. Gén. Exp., LIII, p. 366.

Type locality: Shimoni, BRITISH EAST AFRICA (Alluaud and Jeannel).

DOLICHODERINÆ Forel[1]

(Formicinæ Mayr, part)

Tapinomini Emery

Iridomyrmex MAYR

Iridomyrmex MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 702. EMERY, 1912, 'Gen. Insect., Dolichoderinæ,' p. 21.

Liometopum (part) MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 704.

Formica (part) F. SMITH, LOWNE, ROGER. *Tapinoma* (part) F. SMITH, ROGER.

Acantholepis (part) LOWNE, 1865, Entomologist, II, p. 332.

Hypoclinea (part) MAYR, 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 953.

Tapinoma subg. *Doleromyrma* FOREL, 1907, Ann. Mus. Nat. Hungarici, V, p. 28.

Genotype: *Formica purpurea* F. Smith, 1858 = *Formica detecta* F. Smith, 1858.

1. **Iridomyrmex humilis** (MAYR) EMERY, 1888, Zeitschr. Wiss. Zool., XLVI, p. 386, Pl. XXVIII, figs. 17-19. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 169. H. v. IHERING, 1894, Berlin. Ent. Zeitschr., XXXIX, p. 378. TITUS, 1905, Bull. 52 U. S. Dept. Agric. Bur. Ent., pp. 79-84, fig. 7. NEWELL, 1907, Circ. 13 Louisiana State Crop Pest Com., p. 9. MARTINS, 1907, Broteria, VI, p. 101. FOREL, 1908, Verh. Zool. Bot. Ges. Wien, LVIII, p. 395. FOSTER, 1908, Journ. Econ. Ent., I, pp. 289-293. NEWELL, 1908, 2nd Bien. Rep. Louisiana State Crop Pest Com. (1906-07), pp. 7-9, fig. 1; 1908, Journ. Econ. Ent., I, pp. 21-34 and 152. LOUNSBURY, 1909, Rep. Gov. Ent., Cape Town, (1908), pp. 66-68. WOODWORTH, 1908, Circ. 38 California Agric. Exper. Stat., p. 11, figs. NEWELL and ROSENFELD, 1909, Circ. 27 Louisiana State Crop Pest Com., pp. 112-116, fig. 16. NEWELL, 1909, Journ. Econ. Ent., II, pp. 174-192, fig. 4, and pp. 324-332 (☿, ♀, ♂), Pl. VII; 1909, 3rd Bien. Rep. Louisiana State Crop Pest Com. (1908-09), pp. iv-v. WOODWORTH, 1910, Bull. 207 California Agric. Exper. Stat., pp. 53-83, figs. 1-7. LOUNSBURY, 1910, Rep. Gov. Ent., Cape Town, (1909), pp. 90-91. WHEELER, 1910, 'Ants, Their Structure, etc.,' pp. 153-155, 233, and 542. SAJÓ, 1910, Prometheus, XXI, p. 634, fig. NICKELS, 1911, Journ. Econ. Ent., IV, pp. 353-358. NEWELL, 1911, Bull. 142 Texas Agric. Exper. Stat., p. 37. EMERY, 1912, 'Gen. Insect., Dolichoderinæ,' p. 26, Pl. I, figs. 14, 14*b*. GALLARDO, 1912, Bol. Soc. Physis, I, p. 133; 1913, ibid., I, p. 264. FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 223 (☿). NEWELL and BARBER, 1913, Bull. 122 U. S. Dept. Agric. Bur. Ent., pp. 1-98, fig. 6 and Pl. IV. ARNOLD, 1915, Ann. South African Mus., XIV, p. 145 (☿, ♀, ♂), Pl. IV, figs. 41 and 42. BARBER, 1916, Bull. 377 U. S. Dept. Agric., pp. 1-23. WASMANN, 1917, Ent. Mitt.

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[1] Raffray (1887, Rev. d'Ent., Caen, p. 21) and Wasmann (1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 100) mention a *Bothriomyrmex* [illegible] "Rog." from the Cape Colony, evidently a manuscript name. Moreover, no species of the genus *Bothriomyrmex* is at present known from the Ethiopian Region.

Deutsch. Ent. Mus. Berlin, VI, pp. 184-186. C. W. Mally, 1917, South African Journ. Sci., XIV, pp. 245-247. Barber, 1920, Farmers' Bull. 1101 U. S. Dept. Agric., pp. 1–11, fig. 1 (☿, ♀, ♂).

Hypoclinea (Iridomyrmex) humilis Mayr, 1868, Ann. Soc. Nat. Modena, III, p. 164 (☿); 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 959 (☿).

Iridomyrmex anceps ? Bingham, 1906, Trans. Ent. Soc. London, Proc., p. xxv (☿).

Type locality: Buenos Aires, Argentina (P. de Strobel).

Cape Province: Cape Town (Bingham; G. Arnold; H. Brauns). Basutoland: Maseru (R. M. Sloley). Also in Madeira (Lounsbury).

Engramma Forel

Engramma Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 180. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38.

Tapinoma (part) Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 487.

Genotype: *Engramma lujæ* Forel, 1905.

1. **Engramma allectum** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 394, fig. 9 (☿).

Type locality; Koloka near Angu, Belgian Congo (Schubotz).

2. **Engramma denticulatum** Wm. M. Wheeler. See p. 205 (☿).

Type locality: Lukolela to Basoko, Belgian Congo (Lang and Chapin).

Belgian Congo: Masaki between Masisi and Walikale (J. Bequaert).

3. **Engramma gowdeyi** Wm. M. Wheeler. See p. 207 (☿).

Type locality: Kampala, Uganda (C. C. Gowdey).

4. **Engramma griseopubens** Wm. M. Wheeler. See p. 206 (☿).

Type locality: Lukolela to Basoko, Belgian Congo (Lang and Chapin).

5. **Engramma ilgi** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 264 (☿, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38 (☿, ♂). Forel, 1916, Rev. Suisse Zool., XXIV, p. 431 (☿).

Type locality: Western Abyssinia (Ilg).

Belgian Congo: Makanga (Kohl).

5_1. Var. **stygium** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 117 (☿, ♀, ♂).

Engramma stygium Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 363 (☿, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38.

Type locality: Nairobi, British East Africa (C. Alluaud).

British East Africa: Blue Post Hotel, 1520 m.; Lumbwa, Mau Escarpment, 1891 m.; El Burgon to Ndjoro, 2100 m. (Alluaud and Jeannel). German East Africa: Mt. Kilimanjaro, 2740 m. (Alluaud and Jeannel).

6. **Engramma kohli** Forel, 1916, Rev. Suisse Zool., XXIV, p. 429 (☿, ♀). See p. 203 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Niapu (Lang and Chapin); Lubutu to Kirundu; Tshopo River near Stanleyville (J. Bequaert).

7. **Engramma laurenti** Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38.

Tapinoma laurenti Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 487 (☿, ♀).

Type locality: Belgian Congo (Laurent).

Cameroon: (Conradt).

7_1. Var. **congolense** Forel, 1916, Rev. Suisse Zool., XXIV, p. 431 (☿, ♀ ?).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Bengamisa (Kohl).

8. **Engramma lujæ** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 181, fig. (☿, ♂); 1911, Rev. Zool. Afr., I, p. 279 (☿, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38. See p. 203 (☿).

Type locality: Kondué, Belgian Congo (Luja).

Belgian Congo: Niapu (Lang and Chapin).

8a. Subsp. **wasmanni** Forel, 1916, Rev. Suisse Zool., XXIV, p. 432 (☿, ♀, ♂).

Type locality: Belgian Congo (Kohl).

9. **Engramma wolfi** Forel, 1916, Rev. Suisse Zool., XXIV, p. 432, fig. 1 (☿). See p. 204 (☿, ♀, ♂).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Akenge; Ngayu; Medje (Lang and Chapin); Walikale to Lubutu (J. Bequaert).

10. **Engramma zimmeri** Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 370 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38.

Type locality: Amani, German East Africa (Zimmer).

10a. Subsp. **okiavoense** Forel, 1916, Rev. Suisse Zool., XXIV, p. 431 (☿).

Type locality: Okiavo River, near St. Gabriel, Belgian Congo (Kohl).

Tapinoma Förster

Tapinoma Förster, 1850, 'Hym. Stud.,' I, p. 43. Forel, 1878, Bull. Soc. Vaudoise Sc. Nat., XV, p. 385. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 38.

Micromyrma Dufour, 1857, Ann. Soc. Ent. France, (2) V, p. 60. Roger, 1862; Emery, 1887.

Formica (part) Fabricius, Latreille, etc. *Lasius* (part) Fabricius, 1804. *Myrmica* (part) Lepeletier, F. Smith.

Technomyrmex (part) Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 43.

Genotype: *Tapinoma collina* Förster, 1850 = *Formica erratica* Latreille, 1798.

Subgenus 1. **Tapinoma** Förster, *sensu stricto*

Subgenotype: same as genotype.

1. **Tapinoma acuminatum** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 85 (☿, ♀ ?).

Type locality: Fundu Island, W. Pemba, British East Africa (Voeltzkow).

2. **Tapinoma arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 139 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 154 (☿, ♀, ♂), Pl. iv, fig. 44. Forel, 1916, Rev. Suisse Zool., XXIV, p. 429 (♀ ?).

Type locality: Plumtree, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Bulawayo (G. Arnold). Natal: (Haviland).

2_1. Var. **tectum** (Santschi) Emery *in litt.*

Tapinoma tenue "Forel" var *tectum* Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 288 (☿).

Type locality: Durban, Natal (Marley).

According to information given by Prof. Forel and kindly communicated by Prof. Emery, "*Tapinoma tenue* Forel" was never described and this name was used by mistake for *T. arnoldi*.

3. **Tapinoma danitschi** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 345 (☿).

Type locality: Durban, Natal (C. B. Cooper).

Natal: Umbilo (L. Bevis).

3_1. Var. **bevisi** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 346 (☿).

Type locality: Umbilo, Natal (L. Bevis).

Natal: Durban (C. B. Cooper).

4. **Tapinoma gracile** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 140 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 156 (☿).

Type locality: Matetsi near the Victoria Falls, Rhodesia (G. Arnold).

4_1. Var. **lugubre** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 288 (☿, ♂).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

5. **Tapinoma luridum** Emery, 1908, Ann. Soc. Ent. Belgique, LII, p. 188 (☿); 1912, 'Gen. Insect., Dolichoderinæ,' p. 41.

Type locality: Sankuru, Belgian Congo (Luja).

5a. Subsp. **connexum** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 118, fig. 22 (☿, ♂).

Type locality: Lumbwa, Mau Escarpment, 1897 m., British East Africa (Alluaud and Jeannel).

5b. Subsp. **longiceps** Wm. M. Wheeler. See p. 209 (☿).

Type locality: Zambi, Belgian Congo (Lang, Chapin and Bequaert).

6. **Tapinoma luteum** (Emery) Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru., etc.,' II, 8, p. 18 (♀). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 42. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿). Trägårdh, ibid., p. 45. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 118 (☿, ♀). Arnold, 1915, Ann. South African Mus., XIV, p. 152 (☿).

Technomyrmex luteus Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 43 (☿).

Type locality: Makapan, Transvaal (E. Simon).

Zululand: Junction of the Umfolosi Rivers (I. Trägårdh). German East Africa: Meru Plain (Sjöstedt). British East Africa: River Ramisi; Shimoni (Alluaud and Jeannel).

6a. Subsp. **emeryi** (Forel) Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 42. Arnold, 1915, Ann. South African Mus., XIV, p. 152 (☿, ♀, ♂).

Technomyrmex luteus subsp. *emeryi* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 447 (☿, ♂).

Type locality: Natal (Haviland).

Southern Rhodesia: Bulawayo (G. Arnold).

7. **Tapinoma melanocephalum** (Fabricius) Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 651. Forel, 1881, Mitth. München. Ent. Ver., V, p. 3 (☿). Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 359. Emery, 1887, Ann. Mus. Civ. Genova, XXIV, p. 249 (☿, ♂). Bielups, 1887, Trans. Ent. Soc. London, Proc., p. xxvii. Emery, 1888, Zeitschr. Wiss. Zool., XLVI, p. 392, Pl. xxix, figs. 37-38. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 165. Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 304 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 41. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿, ♀). See p. 1034.

Formica melanocephala Fabricius, 1793, Ent. Syst., II, p. 353. Coquebert, 1799, 'Illustr. Iconogr. Ins.,' I, p. 25 (☿), Pl. vi, fig. 8. Latreille, 1802, 'Hist. Nat. Fourmis.,' p. 269 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 46.

Lasius melanocephalus Fabricius, 1804, 'Syst. Piez.,' p. 417.

Myrmica melanocephala Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 185.

Formica nana Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 125 (☿); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 108 (☿).

Myrmica pellucida F. Smith, 1858, Journ. Proc. Linn. Soc. London, Zool., II, p. 71 (☿).

Myrmica (*Monomarium*) *pellucida* F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 124 (☿).

Formica familiaris F. Smith, 1860, Journ. Proc. Linn. Soc. London, Zool., IV, Suppl., p. 96 (☿).

Micromyrma melanocephala Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 258 (☿, ♀).

Type locality: Cayenne, French Guiana.

Tropicopolitan. French Guinea: Konakry (F. Silvestri).

8. **Tapinoma minimum** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 147 (☿, ♀). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 41. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿). Trägårdh, ibid., p. 45.

Type locality: Tanga, German East Africa (H. Brauns).

Zululand: Dukudu (I. Trägårdh).

9. **Tapinoma voeltzkowi** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 84 (☿, ♂ ?).

Type locality: Fundu Island, W. Pemba, British East Africa (Voeltzkow).

German East Africa: Malindi (Voeltzkow).

9_1. Var. **rhodesiæ** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 139 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 155 (☿), Pl. iv, fig. 43.

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Subgenus 2. **Ecphorella** Forel

Tapinoma subg. *Ecphorella* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 65. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 42.

Subgenotype: *Tapinoma* (*Ecphorella*) *wellmani* Forel, 1909.

10. **Tapinoma** (**Ecphorella**) **wellmani** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 66 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 42.

Type locality: Benguela (C. Wellman).

Technomyrmex Mayr

Technomyrmex Mayr, 1872, Ann. Mus. Civ. Genova, II, p. 147. Forel, 1878, Bull. Soc. Vaudoise Sc. Nat., XV, p. 380. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 42.

Tapinoma (part) F. Smith, Mayr.

Genotype: *Technomyrmex strenuus* Mayr, 1872.

1. **Technomyrmex albipes** (F. Smith). Emery, 1888, Zeitschr. Wiss. Zool., XLVI, pp. 392, 394, Pl. xxix, fig. 49. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 166. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74; 1895, Journ. Bombay Nat. Hist. Soc., IX, p. 466 (☿). Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 301, fig. 91 (☿). Forel, 1908, Bull. Soc. Vaudoise Sc. Nat., (5) XLIV, p. 21 (♂ ergatom.). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 43. See p. 1035.

Formica (Tapinoma) albipes F. Smith, 1862, Journ. Proc. Linn. Soc. London, Zool., VI, p. 38 (☿).

Tapinoma nigrum Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 703 (☿); 1865, 'Reise Novara, Zool., II, Formicidæ,' p. 62 (☿); 1867, Tijdschr. v. Ent., X, p. 78 (☿).

Tapinoma albitarse Motschoulsky, 1863, Bull. Soc. Nat. Moscou, XXXVI, 3, p. 14 (☿, ♀).

Tapinoma albipes Mayr, 1876, Journ. Mus. Godeffroy, XII, p. 83.

Type locality: Tondano, Celebes (A. R. Wallace).

Delagoa: (Liengme).

1₁. Var. **bruneipes** Forel, 1895, Journ. Bombay Nat. Hist. Soc., IX, p. 466 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 43.

Technomyrmex albipes var. *brunneipes* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391.

Type locality: India; not otherwise designated.

French Congo: Mbamu (A. Weiss).

1a. Subsp. **foreli** Emery, 1893, Ann. Soc. Ent. France, LXII, p. 249 (☿); 1895, ibid., LXIV, p. 43. Wasmann, 1899, Notes Leyden Mus., XXI, p. 51. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 446 (☿, ♀, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 43. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 140 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 223 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 150 (☿, ♀, ♂), Pl. iv, fig. 40. Reichensperger, 1915, Med. Göteborgs Mus. Zool. Afd., V, pp. 45 and 73. Skaife, 1921, Trans. Roy. Soc. South Africa, IX, 3, p. 221. See p. 1035.

Type locality: Madagascar.

Angola: St. Paul de Loanda (F. Silvestri). Orange Free State: Bloemfontein (E. Simon). Natal: (R. C. Wroughton; L. v. Muralt; Haviland); Durban (G. Arnold); Mountain Rise near Pietermaritzburg (Skaife). Zululand: Dukudu (I. Trägårdh). Cape Province: Willowmore (H. Brauns); Vrijburg (E. Simon).

1a₁. Var. **affinis** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 119 (☿).

Type locality: Naivasha, Rift Valley, 1900 m., British East Africa (Alluaud and Jeannel).

British East Africa: Molo, Mau Escarpment, 2080 m. (Alluaud and Jeannel).

2. **Technomyrmex andrei** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 488, fig. (☿, ♀); 1912, 'Gen. Insect., Dolichoderinæ,' p. 43.

Technomyrmex mayri Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 3 (☿) (*nec* Forel).

Type locality: Ogowe, French Congo (Mocquerys).

Cameroon: (Conradt). Belgian Congo: Kinshasa (Waelbroeck).

2₁. Var. **camerunensis** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 489 (☿); 1912, 'Gen. Insect., Dolichoderinæ,' p. 43.

Type locality: Cameroon.

2₂. Var. **schereri** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 283 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 43.

Type locality: Cape Mount, Liberia (Scherer).

3. **Technomyrmex arnoldinus** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 222 (☿). Arnold, 1915, Ann. South African Mus., XIV, p. 148 (☿), Pl. iv, figs. 39, 39a.

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

Natal: Durban (C. B. Cooper).

4. **Technomyrmex hypoclinoides** Santschi, 1919, Rev. Zool. Afr., VII, p. 89 (☿).

Type locality: Avakubi, Belgian Congo (J. Bequaert).

5. **Technomyrmex mœrens** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 312, fig. 4 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿).

Type locality: Mbamu, French Congo (A. Weiss).

French Guinea: Kakoulima (F. Silvestri).

6. **Technomyrmex nigriventris** Santschi, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 22, footnote (☿); 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44. Arnold, 1915, Ann. South African Mus., XIV, p. 149 (☿). See p. 210 (☿).

Technomyrmex nigriventris "Santschi" Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (♀, ♂), without description.

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: Kinshasa (Waelbroeck); Thysville (J. Bequaert).

6a. Subsp. **albinasis** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 22 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44. Arnold, 1915, Ann. South African Mus., XIV, p. 150 (☿).

Type locality: Table Mt. near Cape Town, Cape Province (L. Schultze).

7. **Technomyrmex pilipes** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 490 (♀). Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 65 (♀). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44 (♀).

Type locality: Cameroon (Conradt).

French Congo: (Dinklage).

8. **Technomyrmex schoutedeni** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 447 (☿, ♀, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Type locality: Bena Dibele, Belgian Congo (Luja).

9. **Technomyrmex semiruber** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 489 (☿).

Type locality: Cameroon (Conradt).

Semonius Forel

Semonius Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 21. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Genotype: *Semonius schultzei* Forel, 1910.

1. **Semonius schultzei** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 21 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 120, figs. 23 and 24 (☿, ♂). Arnold, 1915, Ann. South African Mus., XIV, p. 157 (☿, ♀, ♂), Pl. iv, fig. 45. Forel, 1916, Rev. Suisse Zool., XXIV, p. 429 (☿).

Semonius schultzi Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 139 (☿).

Type locality: Khakhea, Bechuanaland (L. Schultze).

Belgian Congo: St. Gabriel (Kohl). Southern Rhodesia: Redbank (G. Arnold). Natal: Durban (Marley). German East Africa: Kilema, 1440 m., Mt. Kilimanjaro (Alluaud and Jeannel).

FORMICINÆ Lepeletier

(Formicinæ Mayr, part; Camponotinæ Forel)

Santschiellini Forel

Santschiella Forel

Santschiella Forel, 1916, Rev. Suisse Zool., XXIV, p. 434.

Genotype: *Santschiella kohli* Forel, 1916.

1. **Santschiella kohli** Forel, 1916, Rev. Suisse Zool., XXIV, p. 435, figs. 2–4 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Plagiolepidini Forel

Acropyga Roger

Acropyga Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 242.

Plagiolepis (part) Mayr.

Genotype: *Acropyga acutiventris* Roger, 1862.

1. **Acropyga silvestrii** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 21, fig. 11 (☿).

Type locality: Ghinda, Eritrea (F. Silvestri).

Plagiolepis Mayr

Plagiolepis Mayr, 1861, 'Europ. Formicid.,' p. 42.

Formica (part) Latreille. *Prenolepis* (part) Mayr. *Tapinoma* (part) Schenck, Mayr.

Genotype: *Formica pygmæa* Latreille, 1798.

Subgenus 1. **Plagiolepis** Mayr, *sensu stricto*

Subgenotype: same as genotype.

1. **Plagiolepis alluaudi** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71 (☿). Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 30 (☿, ♀). Donisthorpe, 1908, Bull. Misc. Inform. Bot. Gard. Kew, III, p. 122; 1908, Trans. Leicester Lit. Phil. Soc., XII, p. 229; 1915, 'British Ants,' p. 343. See p. 1035.

Plagiolepis flavidula Ern. André, 1881, 'Spec. Hym. Europ. Algérie,' II, p. 208 (☿). E. Saunders, 1896, 'Hym. Acul. British Islands,' p. 26 (☿) (*nec* Roger).

Type locality: La Misère, Mahé, Seychelles (C. Alluaud).

Introduced in greenhouses in Europe and apparently spreading.

German East Africa: Arusha-chini (Katona).

2. **Plagiolepis brunni** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 148 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿); 1913, ibid., LVII, p. 140 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿, ♂); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 121 (☿).

Plagiolepis bruni Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 248 (☿, ♀, ♂).

Type locality: Delagoa Bay, Portuguese East Africa (H. Brauns).

French Guinea: Maniou (F. Silvestri). British East Africa: Ramisi River; Shimoni (Alluaud and Jeannel). Rhodesia: Bulawayo; Springvale (G. Arnold). Zululand: Umfolosi (I. Trägårdh). Natal: Richmond (I. Trägårdh); Durban (Haviland; G. Arnold).

2_1. Var. **nilotica** Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 7 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 19 (☿).

Plagiolepis brunni subsp. *nilotica* Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 30 (☿).

Type locality: Kaka, White Nile, Anglo-Egyptian Sudan (I. Trägårdh).

Eritrea: Nefasit (F. Silvestri). German East Africa: Kibosho (Katona).

2_2. Var. **pubescens** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 140 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿). Trägårdh, ibid., p. 45.

Type locality: Plumtree, Southern Rhodesia (G. Arnold).

Zululand: Umfolosi (I. Trägårdh).

3. **Plagiolepis capensis** Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 55 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 24 (♀).

Type locality: Cape of Good Hope (Novara Expedition).

Cape Province: Kamaggas (L. Schultze).

4. **Plagiolepis exigua** Forel, 1894, Journ. Bombay Nat. Hist. Soc., VIII, pp. 415 and 417 (☿, ♀). Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 323. Forel, 1913, Rev. Zool. Afr., II, p. 338 (♀). Bequaert, ibid., p. 429. Forel, 1916, Rev. Suisse Zool., XXIV, p. 437 (☿). See p. 1035.

Type locality: Poona, India (Wroughton).

Belgian Congo: (Kohl); Lake Kabwe (J. Bequaert).

4a. Subsp. **abyssinica** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 73 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿).

Type locality: Southern Abyssinia (Ilg).

Eritrea: (K. Escherich).

5. **Plagiolepis funicularis** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 344 (☿).

Type locality: Natal, 3500 ft. (Haviland).

6. **Plagiolepis fuscula** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 45 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 36 (☿).

Type locality: Cape Town, Cape Province (E. Simon).

Natal: (Haviland); Stamford Hill (I. Trägårdh).

7. **Plagiolepis mediorufa** (Forel). See p. 213.

Plagiolepis pygmæa var. *mediorufa* Forel, 1916, Rev. Suisse Zool., XXIV, p. 437 (☿).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Belgian Congo: Stanleyville (Lang and Chapin).

8. **Plagiolepis pygmæa** (Latreille) Mayr, 1861, 'Europ. Formicid.,' p. 43 (☿, ♀, ♂). Schenck, 1861, Jahrb. Ver. Naturk. Nassau, XVI, p. 200 (☿, ♀, ♂); 1864, Progr. Gymnas. Weilburg, p. 13 (☿, ♀, ♂). Forel, 1874, Nouv. Mém. Soc. Helvét. Sci. Nat. Zurich, XXVI, pp. 45 and 338 (☿, ♀, ♂). Ern. André, 1874,

Rev. Mag. Zool., (3) II, p. 179 (☿, ♀, ♂). Mayr, in Fedtschenko, 1877, 'Voy. Turkestan, Formicid.,' p. 5. Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, pp. 208, 209 (☿, ♀, ♂), Pls. vi and vii. Lubbock, 1882, 'Ants, Bees and Wasps,' Ed. 5, p. 11. Forel, 1888, Berlin. Ent. Zeitschr., XXXII, p. 265. Bryant, 1890, 'Fourmis France Centr.,' p. 56. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 173. Forel, 1902, Ann. Soc. Ent. Belgique, XLVI, p. 155 (☿). Santschi, 1908, Ann. Soc. Ent. France, LXXVII, p. 517. Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 224 (☿, ♀).

Formica pygmæa Latreille, 1798, 'Ess. Hist. Fourmis France,' p. 45 (☿, ♀); 1802, 'Hist. Nat. Fourmis,' p. 183 (☿). Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 209 (☿, ♀).

Tapinoma pygmæa Schenck, 1852, Jahrb. Ver. Naturk. Nassau, VIII, pp. 68, 130 (☿, ♀, ♂); 1853, Stettin. Ent. Zeitg., XIV, p. 185 (☿, ♀, ♂). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 56.

Tapinoma pygmæum Mayr, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 375 (☿, ♀, ♂); 1856, Progr. Realsch. Pest, p. 15 (☿). Gredler, 1858, VIII. Progr. Gymnas. Bozen, p. 15.

Formica (*Tapinoma*) *pygmæa* Nylander, 1856, Ann. Sc. Nat. Zool., (4) V, p. 72 (☿, ♀, ♂), Pl. iii, figs. 6 and 22.

Type locality: France.

Southern Europe, North Africa, Asia Minor, Canaries. Rhodesia: Bulawayo; Bembesi (G. Arnold).

8₁. Var. **intermedia** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 45 (☿, ♀, ♂). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 448 (☿, ♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 248 (☿).

Type locality: Bloemfontein, Orange Free State (E. Simon).

Cape Province: Cape Town; Vrijburg (E. Simon). Basutoland: (R. C. Wroughton). Natal: (R. C. Wroughton); Isipingo (C. B. Cooper).

8₂. Var. **punctum** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 448 (☿, ♂). Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 35 (☿, ♀). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 248 (☿); 1916, Rev. Suisse Zool., XXIV, p. 437 (☿).

Type locality: Mountains of Natal (R. C. Wroughton).

Natal: Richmond (I. Trägårdh); Durban. Basutoland: (R. C. Wroughton). Belgian Congo: St. Gabriel (Kohl).

Subgenus 2. **Anacantholepis** Santschi

Plagiolepis subg. *Anacantholepis* Santschi, 1914, Med. Götebergs Mus. Zool. Afd., III, p. 36.

Subgenotype: *Plagiolepis* (*Anacantholepis*) *decora* Santschi, 1914.

9. **Plagiolepis** (**Anacantholepis**) **bothæ** Forel.

Plagiolepis bothæ Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86 (♀, ♂).

Type locality: Fundu Island, W. Pemba, British East Africa (Voeltzkow).

10. **Plagiolepis** (**Anacantholepis**) **decora** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 36, fig. 9 (☿).

Type locality: Stamford Hill, Natal (I. Trägårdh).

11. **Plagiolepis** (**Anacantholepis**) **deweti** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249.

Plagiolepis deweti Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 423 (☿, ♀).

Type locality: Mountains of Natal (R. C. Wroughton).

Cape Province: Cape of Good Hope (Burchell); King William's Town (R. Godfrey).

12. **Plagiolepis (Anacantholepis) jouberti** Forel. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 122 (☿).

Plagiolepis jouberti Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 23 (☿).

Type locality: Kamaggas, Cape Province (L. Schultze).

British East Africa: Shimoni (Alluaud and Jeannel).

13. **Plagiolepis (Anacantholepis) pictipes** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 122, fig. 25 (☿).

Type locality: Mbuyuni, Pori, 1110 m., British East Africa (Alluaud and Jeannel).

14. **Plagiolepis (Anacantholepis) vanderkelleni** Forel.

Plagiolepis vanderkelleni Forel, 1894, Mitth. Schweiz. Ent. Ges., X, p. 310 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

14_1. Var. **tricolor** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 24 (☿).

Type locality: Kooa to Sekgoma, Bechuanaland (L. Schultze).

14a. Subsp. **polita** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 37, fig. 10 (♀).

Type locality: Stamford Hill, Natal (I. Trägårdh).

Subgenus 3. **Anoplolepis** Santschi

Plagiolepis subg. *Anoplolepis* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123.

Subgenotype: *Formica longipes* Jerdon, 1851.

15. **Plagiolepis (Anoplolepis) braunsi** Forel.

Plagiolepis braunsi Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 141 (☿).

Plagiolepis (Anoplolepis) braunsi Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123.

Type locality: Willowmore, Cape Province (H. Brauns).

16. **Plagiolepis (Anoplolepis) carinata** Emery. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123.

Plagiolepis carinata Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 491 (☿, ♀). Forel, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391 (☿, ♀). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿).

Type locality: Cameroon (Conradt).

French Congo: Brazzaville (A. Weiss). Belgian Congo: Mayombe (Deleval).

17. **Plagiolepis (Anoplolepis) custodiens** (F. Smith) Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 38 (☿, ♀, ♂). See p. 213.

Formica custodiens F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 33 (☿). Roger, 1863, 'Verzeich. Formicid.,' p. 15. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 414.

Camponotus hendecarthrus Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 128 (☿, ♀); 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 458.

Formica berthoudi Forel, 1876, Bull. Soc. Vaudoise Sc. Nat., (2) XIV, p. 33 (☿).

Plagiolepis custodiens Mayr, 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 493. Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 215 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 117 (♀). Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 350 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 73. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 43. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 148 (☿, ♀, ♂). Wasmann, 1896, Notes Leyden Mus., XVIII, p. 75. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39. Emery, 1899, Ann. Soc. Ent. Belgique, XLV, p. 491 (☿, ♀). Wasmann, 1900, Illustr. Zeitschr. Ent., V, p. 103; 1904, Notes Leyden Mus., XXV, pp. 15, 73, and 75. Zavattari, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 550, p. 2 (☿). Kolbe, 1907, Ann. Soc. Ent. Belgique, LI, p. 364. Forel, 1909, ibid., LIII, p. 54 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 23 (☿, ♀, ♂). Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 202; 1912, Zeitschr. Wiss. Zool., CI, p. 106. Trägårdh, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 46. Reichensperger, 1915, ibid., V, p. 18. Wasmann, 1917, Ent. Mitt. Deutsch. Ent. Mus. Berlin, VI, p. 185; 1920, Tijdschr. v. Ent., LXII, (1919), pp. 119 and 120. Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., p. lvi.

Type locality: Port Natal, Natal.

Belgian Congo: Banana (Busschodts; Lang and Chapin). Angola: St. Paul de Loanda (F. Silvestri); San Antonio (Lang and Chapin). Rhodesia: Kazungula (Jallá). German Southwest Africa: (Lübbert); Okahandja (Dinter). Bechuanaland: Lehututu to Kang; Khakhea to Kang; Kooa to Sekgoma (L. Schultze). Cape Province: Kimberley; Vrijburg (E. Simon); Willowmore (H. Brauns). Natal: Pietermaritzburg (I. Trägårdh); Malvern (O'Neil); Durban. Basutoland: Lessouto (P. Berthoud). Orange Free State: Bothaville (H. Brauns). Transvaal: Lydenburg (Wilms); Makapan; Pretoria; Hamman's Kraal (E. Simon); Valdezia (P. Berthoud). Zululand: Umfolosi (I. Tragårdh). Portuguese East Africa: Delagoa Bay (Liengme). German East Africa: Daressalaam (H. Brauns); Bagamoyo (Stuhlmann; Le Roy). Zanzibar. British East Africa: Kikuyu Escarpment, 2250 m. (Alluaud and Jeannel). Somaliland: (C. Keller).

17_1. Var. **detrita** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 118 (☿). Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 350 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172.

Type locality: Obbia, Somaliland (Bricchetti-Robecchi).

Somaliland: (C. Keller).

17_2. Var. **hirsuta** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 118 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172.

Type locality: Ellahelaj, Somaliland (Bricchetti-Robecchi).

17_3. Var. **pilipes** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 118 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 180; 1897, ibid., XXXVIII, p. 601.

Type locality: Milmil, SOMALILAND (Bricchetti-Robecchi).

ABYSSINIA: Ogaden (Ruspoli); Boran Galla, Middle Ganale; Webi (Bricchetti-Robecchi). SOMALILAND: Wells of Laffarugh to wells of Aberio (V. Bottego).

17a. Subsp. **fallax** (MAYR) EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 43. FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿).

Plagiolepis fallax MAYR, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 54 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 172. WASMANN, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 113; 1896, Notes Leyden Mus., XVIII, p. 75. E. SIMON, 1899, Bull. Soc. Ent. France, p. 179. WASMANN, 1900, Zool. Jahrb. Abt. Syst., XIV, p. 68. PÉRINGUEY, 1900, Ann. Soc. Ent. France, LXIX, p. 67. FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (♀ ?); 1910, ibid., LIV, p. 449 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 24 (☿, ♀).

Plagiolepis (Anoplolepis) custodiens var. *fallax* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿).

Type locality: Cape of Good Hope (Novara Expedition; Raffray).

CAPE PROVINCE: Constantia (F. Silvestri); Stormsvlei; Swellendam (F. Purcell); Cape Town (Wilms; E. Simon); Willowmore (H. Brauns). NATAL: (Haviland). BELGIAN CONGO: Umangi (Wilwerth; this record probably does not refer to the subsp. *fallax*).

18. **Plagiolepis (Anoplolepis) decolor** EMERY.

Plagiolepis decolor EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 44 (☿). FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 23 (☿, ♀, ♂).

Type locality: Kimberley, CAPE PROVINCE (E. Simon).

TRANSVAAL: Hamman's Kraal (E. Simon). GERMAN SOUTHWEST AFRICA: Cape Cross (L. Schultze). BECHUANALAND: Khakhea to Kooa (L. Schultze).

19. **Plagiolepis (Anoplolepis) longipes** (JERDON) SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123. See p. 1036.

Formica longipes JERDON, 1851, Madras Journ. Litt. Sc., XVII, p. 122 (☿); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 105 (☿).

Formica gracilipes F. SMITH, 1857, Journ. Proc. Linn. Soc. London, Zool., II, p. 55 (☿); 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 22 (☿).

Formica trifasciata F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 27 (♀).

Prenolepis gracilipes MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 698.

Plagiolepis gracilipes MAYR, 1867, Tijdschr. v. Ent., X, p. 73 (☿, ♀); 1870, Verh. Zool. Bot. Ges. Wien, XX, p. 947. ROTHNEY, 1889, Trans. Ent. Soc. London, p. 373. MAYR, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197.

Plagiolepis longipes EMERY, 1887, Ann. Mus. Civ. Genova, XXIV, p. 247; 1888, Zeitschr. Wiss. Zool., XLVI, p. 385, Pl. XXVII, figs. 8–9. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 173. FOREL, 1894, Journ. Bombay Nat. Hist. Soc., VIII, p. 414 (☿). MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 149. H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39. BINGHAM, 1903, 'Fauna Brit. India, Hym.,' II, p. 320, fig. 97 (☿).

Type locality: INDIA (Jerdon).

Tropicopolitan. ZANZIBAR (H. Brauns; Stuhlmann).

20. **Plagiolepis (Anoplolepis) nuptialis** SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 289 (♂).

Type locality: Willowmore, CAPE PROVINCE (G. Arnold).

CAPE PROVINCE: Keurbooms River near Plettenberg Bay (H. Brauns).

21. **Plagiolepis (Anoplolepis) opaciventris** Emery.

Plagiolepis opaciventris Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 492 (♀).

Plagiolepis steingræveri Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 44 (♀; *nec* ☿, *nec* Forel).

Type locality: Gaboon, French Congo.

22. **Plagiolepis (Anoplolepis) rufescens** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 289 (☿).

Type locality: Cape Town, Cape Province (Reichensperger).

23. **Plagiolepis (Anoplolepis) steingröveri** Forel. See p. 1036.

Plagiolepis steingroveri Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 23 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 287 (☿).

Plagiolepis steingræveri Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 44 (☿; *nec* ♀). Wasmann, 1904, Notes Leyden Mus., XXV, pp. 73 and 75; 1911, Tijdschr. v. Ent., LIV, p. 202; 1912, Zeitschr. Wiss. Zool., CI, p. 106; 1920, Tijdschr. v. Ent., LXII, (1919), p. 120.

Plagiolepis (Anoplolepis) steingroweri Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123.

Type locality: Angra Pequeña, German Southwest Africa (Steingröver).

Mossamedes: (Baum and Van der Kellen). German Southwest Africa: (Lübbert); Lüderitzbucht (L. Schultze). Bechuanaland: Kooa; Severelela to Khakhea (L. Schultze). Cape Province: Cape Town (E. Simon; Wilms); Willowmore (H. Brauns). Orange Free State: Bothaville (H. Brauns); Bloemfontein (E. Simon). Transvaal: Makapan; Hebron (E. Simon).

24. **Plagiolepis (Anoplolepis) tenella** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123. See p. 214.

Plagiolepis tenella Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 364 (☿); 1911, Rev. Zool. Afr., I, p. 210 (☿). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 61 (♀; without description).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: Lower Congo, in stomach of *Manis temmincki* (Solon); Niapu; Akenge; Medje; Bafwasende; Garamba (Lang and Chapin).

25. **Plagiolepis (Anoplolepis) trimeni** Forel.

Plagiolepis trimenii Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 430 (replete ☿).

Plagiolepis trimeni Emery, 1899, ibid., XLIII, p. 492 (☿). Gilchrist, 1910, Agric. Journ. Cape of Good Hope, XXXVI, p. 328. Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 223 (☿).

Type locality: Natal (Mutschinson).

Rhodesia: Bulawayo; Bembesi (G. Arnold).

26. **Plagiolepis (Anoplolepis) tumidula** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 19, fig. 10 (☿, ♂).

Type locality: Ghinda, Eritrea (F. Silvestri).

Acantholepis Mayr

Acantholepis Mayr, 1861, 'Europ. Formicid.,' p. 42.

Formica (part) F. Smith. *Hypoclinea* (part) Mayr, Roger.

Genotype: *Hypoclinea frauenfeldi* Mayr, 1855.

1. **Acantholepis arenaria** Arnold, 1920, Ann. South African Mus., XIV, pp. 555 and 560, fig. 56 (☿).

Type locality: Sawmills, Umgusa River, Southern Rhodesia (G. Arnold).

2. **Acantholepis arnoldi** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 142 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 563 (☿).

Type locality: Bulawayo, Rhodesia (G. Arnold).

Rhodesia: Redbank (G. Arnold).

3. **Acantholepis capensis** Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, pp. 699 (☿) and 770 (♂); 1863, ibid., XIII, p. 394. Roger, 1863, 'Verzeich. Formicid.,' p. 11. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 56 (☿, ♂), Pl. II, fig. 16. Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 366 (☿, ♀, ♂). Magretti, 1884, ibid., XXI, p. 537 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883) p. 244 (☿). Péringuey, 1886, Trans. Ent. Soc. London, Proc., p. xxxvi. Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 42 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 171. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 108, 118, and 215. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 46. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 149. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 180 (♀). Wasmann, 1896, Notes Leyden Mus., XVIII, p. 76; 1898, Wien. Ent. Zeitg., XVII, p. 97; 1899, Notes Leyden Mus., XXI, pp. 39 and 51. Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; 1904, Mém. Ac. Sc. St. Pétersbourg, IX, (1903), p. 387 (☿). Wasmann, 1904, Notes Leyden Mus., XXV, pp. 37 and 73. Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 310 and 379. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (☿, ♀); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿, ♀, ♂); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 265 (☿, ♀, ♂). Wasmann, 1911, Tijdschr. v. Ent., LIV, p. 202; 1912, Zeitschr. Wiss. Zool., CI, pp. 104 and 106. Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, p. 203. Forel, 1913, Rev. Zool. Afr., II, p. 338 (☿). Bequaert, ibid., p. 429. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿, ♀). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 377 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 126 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 557 and 568 (☿, ♂). See p. 1036.

Type locality: Table Mountain at the Cape of Good Hope, Cape Province (Novara Expedition).

French Guinea: Los Islands (H. Brauns). Sierra Leone: (Mocquerys). Belgian Congo: Elisabethville; Sankisia (J. Bequaert). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). German Southwest Africa: (Peters); Kubub (L. Schultze); Gobabis (Boschmann); Cape Cross to Swakopmund (Dinter). Bechuanaland: Kooa; Khakhea to Kang (L. Schultze). Cape Province: Port Elizabeth; Willowmore (H. Brauns); Sir Lowry Pass (F. Purcell); Cape Town; Matjesfontein (E. Simon). Transvaal: Makapan (E. Simon); Pretoria (E. Simon; F. Silvestri). Natal: Estcourt (R. C. Wroughton). Delagoa: (Liengme). Eritrea: Asmara; Nefasit; Ghinda (K. Escherich); Keren; Sciotel (Beccari). Abyssinia: (Ilg); Boran Galla; Auata (V. Bottego); Adis Abeba (Kachovsky). Anglo-Egyptian Sudan: Sebderat near Kassala (Magretti).

3a. Var. **anceps** Forel, 1916, Rev. Suisse Zool., XXIV, p. 438 (☿). See p. 215.

Type locality: Belgian Congo (Kohl).

Belgian Congo: Stanleyville; Medje (Lang and Chapin).

3_2. Var. **guineensis** Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 296 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 125 (☿). See p. 215.

Type locality: Akra, Gold Coast (R. Buchholz).

Belgian Congo: Thysville (Lang and Chapin).

3_3. Var. **simplicoides** (Forel) Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 125 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 572 (☿).

Acantholepis capensis subsp. *simplicoides* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86, footnote (☿).

Type locality: Basutoland (R. C. Wroughton).

3_4. Var. **validiuscula** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 602 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 143 (☿); 1913, Rev. Zool. Afr., II, p. 338 (♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 126 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 557 and 570 (☿, ♀, ♂). See p. 216.

Type locality: Webi, Abyssinia (Ruspoli).

Belgian Congo: Sankisia (J. Bequaert); Thysville (J. Bequaert; Lang and Chapin). Rhodesia: very common (G. Arnold). Cape Province: very common (G. Arnold); Kimberley (Power); King William's Town (R. Godfrey).

3a. Subsp. **canescens** (Emery) Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 187, 189, 190, 197, 198, and 215. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 124 and 126 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿). Emery, 1915, ibid., X, p. 4 (☿). Reichensperger, 1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 122. Wasmann, 1918, Tijdschr. v. Ent., LX, (1917), p. 397. See p. 216.

Acantholepis capensis var. *canescens* Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 601 (☿); 1899, ibid., XXXIX, p. 500. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 8; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 389 Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 280 (☿). Gestro, 1911, Bull. Soc. Ent. Italiana, XLI, (1909), pp. 257 and 260. Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 390 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 9 (☿).

Type locality: Coromma, Abyssinia (Ruspoli).

Senegambia: Dakar (F. Silvestri). French Guinea: Kindia (F. Silvestri). Gold Coast. Aburi (F. Silvestri). Southern Nigeria: Lagos (F. Silvestri). French Congo: Brazzaville (A. Weiss). Belgian Congo: Congo da Lemba (R. Mayné); Thysville (J. Bequaert); Avakubi (Lang and Chapin). German East Africa: Lake Mohasi (Schubotz). British East Africa: Ramisi; Blue Post Hotel, Kikuyu, 1520 m. (Alluaud and Jeannel). Uganda: Unyoro Province, near Hoima; region of Lake Albert (C. Alluaud); Gondokoro (F. Werner). Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh); Khartum (Karawaiew); near Renk; between Khartum and Fashoda. Abyssinia: Buditu to Dimé (V. Bottego); Diré Daua; Abuker; Bisa Timo; Gebel Hakim; Harar (Kristensen); Lake Abaja (Ruspoli). Eritrea: Ghinda; Nefasit (F. Silvestri); Sciotel, Bogos (Beccari). Saganeiti; Adi Ugri; Adi Caié (Andreini).

3a$_1$. Var. **cacozela** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 126 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿). See p. 216.

Acantholepis capensis var. *cacozela* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 395 (☿).

Type locality: French Congo.

Southern Nigeria: Olokemeji (F. Silvestri). Belgian Congo: Faradje (Lang and Chapin). French Congo: Fort Crampel (Schubotz).

3b. Subsp. **depilis** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 602 (☿, ♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 126 (☿).

Acantholepis carbonaria Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 119 (☿, part and ♀).

Type locality: Arigalgala, Somaliland (Ruspoli).

Abyssinia: Leboi (Ruspoli).

3c. Subsp. **hirsuta** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 124 and 126, fig. 26 (☿).

Type locality: Molo, Mau Escarpment, 2420 m., British East Africa (Alluaud and Jeannel).

3c$_1$. Var. **elevata** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 573 (☿).

Type locality: Hillside, Bulawayo, Rhodesia (G. Arnold).

3d. Subsp. **incisa** Forel, 1913, Rev. Zool. Afr., II, p. 338 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 125, fig. 27 (☿).

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

British East Africa: Kijabe, Kikuyu Escarpment, 2100 m. (Alluaud and Jeannel).

3e. Subsp. **junodi** Forel, 1916, Rev. Suisse Zool., XXIV, p. 438 (☿). Arnold, 1920, Ann. South African Mus., XXIV, p. 572 (☿).

Type locality: Shilouvane, Transvaal (Junod).

3f. Subsp. **lævis** (Santschi).

Acantholepis simplex subsp. *lævis* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿).

Acantholepis lævis Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 312, fig. 5 (☿).

Type locality: St. Louis, Senegambia (Claveau).

French Guinea: Konakry (F. Silvestri).

3f$_1$. Var. **alexis** Arnold, 1920, Ann. South African Mus., XIV, pp. 557 and 573 (☿).

Type Locality: Hillside, Bulawayo, Rhodesia (G. Arnold).

3g. Subsp. **simplex** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86, footnote. Arnold, 1920, Ann. South African Mus., XIV, pp. 557 and 572 (☿, ♂).

Acantholepis simplex Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 42 (☿); 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 350 (☿, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 172. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 107; 1912, Zeitschr. Wiss. Zool., CI, p. 103. Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, p. 197. Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 143 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 123 (☿).

Type locality: Somaliland (C. Keller).

Rhodesia: Bulawayo (G. Arnold). British East Africa: Ramisi (Alluaud and Jeannel). Uganda: Kadjura Swamp, near Hoima, region of Lake Albert (C. Alluaud). Cape Province: Grahamstown (Baines and Cherry).

3g_1. Var. **minuta** (Forel).

Acantholepis simplex var. *minuta* Forel, 1916, Rev. Suisse Zool., XXIV, p. 438 (☿).

Acantholepis capensis var. *minuta* Arnold, 1920, Ann. South African Mus., XIV, p. 572 (☿).

Type locality: Shilouvane, Transvaal (Junod).

4. **Acantholepis capitata** Forel, 1913, Rev. Zool. Afr., II, p. 338 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

5. **Acantholepis carbonaria** Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 119 (☿, part; *nec* ♀). Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 42 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 171. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 74. Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 390 (☿). See p. 216.

Type locality: Obbia, Somaliland (Bricchetti-Robecchi).

Southern Abyssinia: (Ilg). Belgian Congo: Kwidjwi Island, Lake Kivu; Mawambi to Avakubi (Schubotz); Banana (Lang and Chapin).

5_1. Var. **erythræa** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 265 (☿, ♀). Wasmann, 1912, Zeitschr. Wiss. Zool., CI, p. 104. Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Type locality: Nefasit, Eritrea (K. Escherich; F. Silvestri).

Eritrea: Ghinda (K. Escherich). Abyssinia: Harar (Ilg).

5_2. Var. **obtusa** Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63 (☿).

Type locality: Saati, Eritrea (Belli).

Eritrea: Sabarguma (Belli).

5*a*. Subsp. **baumi** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿).

Type locality: Mossamedes (Baum and Van der Kellen).

6. **Acantholepis crinita** Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 149 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 565 (☿).

Type locality: Port Natal, Natal (H. Brauns).

7. **Acantholepis curta** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 603, fig. (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿).

Acantholepis capensis Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 527 (☿). (*nec* Mayr).

Type locality: Assab, Eritrea (Doria).

Eritrea: Ras Doumeira (Doria). Belgian Congo: Yambata (R. Mayné).

8. **Acantholepis deplanata** Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 390, fig. 8 (☿).

Type locality: Buddu Forest, northwest of Bukoba, German East Africa (Schubotz).

9. **Acantholepis depressa** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 126, fig. 28 (☿).

Type locality: Ramisi River, British East Africa (Alluaud and Jeannel).

10. **Acantholepis egregia** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 143 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 557 and 574 (☿).

Type locality: Redbank, Southern Rhodesia (G. Arnold).

10a. Subsp. **santschii** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 575 (☿).

Type locality: Cawston Farm, Umgusa River, Southern Rhodesia (G. Arnold).

11. **Acantholepis foreli** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 564 (☿), Pl. viii, fig. 121.

Type locality: Sipapoma, Southern Rhodesia (G. Arnold).

11_1. Var. **convexa** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 565 (☿).

Type locality: Hillside, Bulawayo, Southern Rhodesia (G. Arnold).

11_2. Var. **impressa** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 565 (☿).

Type locality: Hillside, Bulawayo, Southern Rhodesia (G. Arnold).

12. **Acantholepis gerardi** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 262 (☿).

Type locality: Kalanga, Upper Lukuga, Belgian Congo (Gérard).

Belgian Congo: Kataki (Gérard).

13. **Acantholepis gracilicornis** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 42 (☿). Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 265 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 9 (☿).

Type locality: Aden, Southern Arabia (F. Ris).

Eritrea: Asmara (K. Escherich); Sabarguma (Belli). Anglo-Egyptian Sudan: Port Sudan; Khartum; Assuan (Karawaiew).

13a. Subsp. **abdominalis** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 73 (☿).

Type locality: Southern Abyssinia (Ilg).

14. **Acantholepis longinoda** Arnold, 1920, Ann. South African Mus., XIV, pp. 555 and 559 (☿, ♀), Pl. viii, figs. 120 and 120a.

Type locality: Hillside, Bulawayo, Southern Rhodesia (G. Arnold).

15. **Acantholepis nigriventris** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 493 (☿).

Type locality: Cameroon (Conradt).

16. **Acantholepis rubrovaria** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 142. Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 562 (☿, ♂).

Acantholepis simplex var. *rubrovaria* Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿).

Type locality: Basutoland (R. C. Wroughton).

16a. Subsp. **pilosa** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 141 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 562 (☿).

Type locality: Redbank, Southern Rhodesia (G. Arnold).

$16a_1$. Var. **avunculus** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 563 (☿).

Type locality: Sawmills, Umgusa River, Southern Rhodesia (G. Arnold).

17. **Acantholepis silvicola** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 576, fig. 57 (☿, ♀, ♂).

Type locality: Amatongas Forest, Portuguese East Africa (G. Arnold).

18. **Acantholepis spinosior** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 144 (☿). Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 557 (☿, ♀).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

18_1. Var. **ballaensis** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 558 (☿).

Type locality: Balla-Balla, Southern Rhodesia (G. Arnold).

18_2. Var. **natalensis** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 559 (☿).

Type locality: Pietermaritzburg, Natal (C. Akerman).

19. **Acantholepis submetallica** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 566 (☿, ♀, ♂).

Type locality: Bulawayo, Southern Rhodesia (G. Arnold).

19_1. Var. **aspera** Arnold, 1920, Ann. South African Mus., XIV, pp. 556 and 568 (☿).

Type locality: Amatongas Forest, Portuguese East Africa (G. Arnold).

20. **Acantholepis vestita** (F. Smith) Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 333, 336, and 365.

Formica vestita F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 214.

Type locality: Port Natal, Natal.

Natal: Colenso; Newcastle (Dixey and Longstaff). Cape Province: Stormberg Junction; Shanks Station (Dixey and Longstaff).

Myrmelachistini Forel

Aphomomyrmex Emery

Aphomomyrmex Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 493.

Genotype: *Aphomomyrmex afer* Emery, 1899.

1. **Aphomomyrmex afer** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 494, fig. (☿, ♀). Forel, 1910, ibid., LIV, p. 449 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (♀). Arnold, 1920, Ann. South African Mus., XIV, p. 553 (☿).

Type locality: Cameroon (Conradt; v. Muralt).

West Africa: (Fülleborn).

2. **Aphomomyrmex muralti** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 449 (☿). Arnold, 1920, Ann. South African Mus., XIV, p. 553 (☿).

Type locality: Natal (L. v. Muralt).

Prenolepidini Forel

Prenolepis Mayr

Prenolepis Mayr, 1861, 'Europ. Formicid.,' p. 52.

Paratrechina Motschoulsky, 1863, Bull. Soc. Natural. Moscou, XXXVI, 3, p. 13.

Formica (part) Latreille *et auctor*. *Lasius* Mayr. *Tapinoma* F. Smith, Mayr, etc.

Genotype: *Formica imparis* Say, 1836.

Subgenus 1. Prenolepis Mayr, *sensu stricto*

Subgenotype: same as genotype.

1. **Prenolepis kohli** Forel, 1916, Rev. Suisse Zool., XXIV, p. 438 (☿, ♀?).

Type locality: St. Gabriel, Belgian Congo (Kohl).

Subgenus 2. **Nylanderia** Emery

Prenolepis subg. *Nylanderia* Emery, 1906, Ann. Soc. Ent. Belgique, L, p. 134.

Subgenotype: ***Formica vividula*** Nylander, 1846.

2. **Prenolepis (Nylanderia) albipes** Emery.

Prenolepis albipes Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 497 (☿).

Type locality: Cameroon (Conradt).

3. **Prenolepis (Nylanderia) bourbonica** Forel. See p. 1037.

Prenolepis nodifera subsp. *bourbonica* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 210 (♀, ♂).

Prenolepis bourbonica Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 82 (☿, ♀, ♂), Pl. III, fig. 2; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 87 (☿).

Type locality: Réunion.

British East Africa: Chake-Chake, Pemba Island (Voeltzkow).

4. **Prenolepis (Nylanderia) grisoni** Forel, 1914, Rev. Suisse Zool., XXIV, p. 440, fig. 5 (☿).

Type locality: Bengamisa, Belgian Congo (Kohl).

5. **Prenolepis (Nylanderia) incallida** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 263, fig. 12 (☿).

Type locality: San Thomé Island.

6. **Prenolepis (Nylanderia) jægerskiœldi** Mayr.

Prenolepis jægerskiœldi Mayr, in Jagerskiöld, 1903, 'Exped., IX, Formicid.,' p. 8 (☿). Emery, 1906, Ann. Soc. Ent. Belgique, L, p. 130. Karawaiew, 1911, Rev. Russe Ent., XI, p. 9, fig. 3 (☿, ♀, ♂).

Prenolepis (Nylanderia) jægerskjœldi Emery, 1910, Deutsch. Ent. Zeitschr., pp. 127 and 130, figs. 4 and 5 (☿, ♀, ♂).

Prenolepis viridula Ern. André, 1881, Ann. Soc. Ent. France, (6) I, p. 61 (☿, ♀, ♂); 1882, 'Spec. Hym. Europ. Algérie,' II, pp. 204 and 206 (☿, ♀, ♂), Pl. x, figs. 8–10 and 12 (*ex typ.*). Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 88 (♂), Pl. II, fig. 1 (*ex typ.*) (*nec viridula* Nylander).

Prenolepis jægerskiœldi var. *borcardi* Santschi, 1908, Ann. Soc. Ent. France, LXXVII, p. 533, fig. 12 (☿, ♀, ♂).

Prenolepis (Nylanderia) jægerskiœldi Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 128 (☿).

Type locality: Cairo, Egypt (Jagerskiöld; Karawaiew; Borcard).

Egypt, Cyprus, Syria. German East Africa: Tanga (Alluaud and Jeannel).

7. **Prenolepis (Nylanderia) lepida** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 262, fig. 11 (☿).

Type locality: Victoria, Cameroon (Reichensperger).

8. **Prenolepis (Nylanderia) longicornis** (Latreille) Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 127 (☿). Lamborn, 1920, Trans. Ent. Soc. London, (1919), Proc., p. lvi. See pp. 217 and 1038.

Formica longicornis Latreille, 1802, 'Hist. Nat. Fourmis,' p. 113 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 31. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 417.

Formica vagans Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 124 (☿, ♀); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 107 (☿, ♀).

Formica (Tapinoma) gracilescens Nylander, 1856, Ann. Sc. Nat. Zool., (4) V, p. 73 (☿), Pl. iii, fig. 20.

Formica gracilescens Nylander, 1856, Ann. Soc. Ent. France, (3) IV, Bull., p. xxviii (☿).

Tapinoma gracilescens F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 56. White, 1883, 'Ants and Their Ways,' p. 257 (♀). Fowler, 1885, Ent. Monthly Mag., XXII, p. 276.

Prenolepis gracilescens Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 698.

Paratrechina currens Motschoulsky, 1863, Bull. Soc. Nat. Moscou, XXXVI, 3, p. 14.

Prenolepis longicornis Roger, 1863, 'Verzeich. Formicid.,' p. 10. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 50 (♀); 1867, Tijdschr. v. Ent., X, p. 72 (☿, ♀). Frauenfeld, 1867, Verh. Zool. Bot. Ges. Wien, XVII, p. 442. Mayr, 1870, ibid., XX, p. 947 (☿); 1876, Journ. Mus. Godeffroy, XII, p. 77. Ern. André, 1881, Ann. Soc. Ent. France, (6) I, p. 60 (♀, ♂). Forel, 1881, Mitth. München. Ent. Ver., V, p. 2. Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, pp. 203, 205, and 206 (☿, ♀, ♂), Pl. x, fig. 11. Emery, 1888, Zeitschr. Wiss. Zool., XLVI, p. 379, Pl. xxvii, fig. 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 179. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 9 (☿). Longstaff, 1911, Ent. Monthly Mag., XLVII, p. 124. Forel, 1913, Rev. Zool. Afr., II, p. 339 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿, ♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 395 (☿). Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 3 (♀).

Prenolepis longicornis var. *hagemanni* Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 65 (☿); 1907, ibid., XXIV, p. 15; 1916, Rev. Suisse Zool., XXIV, p. 441 (☿).

Type locality: Senegal.

Tropicopolitan. West Africa: (Jourdan). French Guinea: Konakry; Kakoulima (F. Silvestri). Southern Nigeria: Lagos (F. Silvestri). San Thomé: (de Seabra). French Congo: Fort de Possel to Fort Crampel (Schubotz). Belgian Congo: Boma (C. Hagemann; Styczinski); Congo da Lemba (R. Mayné); Leopoldville; Kwamouth (J. Maes); St. Gabriel (Kohl); Zambi; Stanleyville (Lang and Chapin); Libenge (Schubotz). Anglo-Egyptian Sudan: Khartum (Karawaiew). German East Africa: Tanga (Alluaud and Jeannel); Lindi (Lamborn); Nguela, Usambara. Natal: Durban (G. Arnold; C. B. Cooper).

9. **Prenolepis (Nylanderia) trægaordhi** Forel.

Prenolepis tragaordhi Forel, in Wasmann, 1904, 'Termitophilen aus dem Sudan, Res. Swed. Zool. Exped. Jägerskiöld,' XIII, p. 14 (☿, ♂).

Type locality: Kaka, White Nile, Anglo-Egyptian Sudan (I. Trägårdh).

9_1. Var. **natalensis** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 348 (☿).

Type locality: Durban, Natal (G. Arnold).

10. **Prenolepis (Nylanderia) vividula** (Nylander) Emery, 1906, Ann. Soc. Ent. Belgique, L, p. 134, figs. 1–4 (☿, ♀, ♂). See p. 218.

Formica vividula Nylander, 1847, Acta Soc. Sc. Fennicæ, II, 2, p. 900 (☿, ♀, ♂), Pl. xviii, figs. 2 and 10–14.

Prenolepis vividula Mayr, 1861, 'Europ. Formicid.,' p. 52; 1870, Verh. Zool. Bot. Ges. Wien, XX, pp. 948 and 949 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 180.

Type locality: in the hothouses of the Botanical Garden at Helsingfors, Finland (Nylander).

Tropicopolitan. Belgian Congo: Niapu (Lang and Chapin).

11. **Prenolepis (Nylanderia) waelbroecki** Emery.

Prenolepis waelbroecki Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 496, fig. (☿, ♂).

Prenolepis waelbroeki Forel, 1909, ibid., LIII, p. 54 (♂); 1911, Rev. Zool. Afr., I, p. 280 (☿?).

Type locality: Kinshasa, Belgian Congo (Waelbroeck).

Belgian Congo: Congo da Lemba (R. Mayné).

12. **Prenolepis (Nylanderia) weissi** Santschi, 1911, Rev. Zool. Afr., I, p. 210 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

13. **Prenolepis (Nylanderia) zelotypa** Santschi.

Prenolepis (Nylanderia) jägerskiöldi var. *zelotypa* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 264 (☿).

Prenolepis zelotypa Santschi, 1919, Rev. Zool. Afr., VI, p. 238.

Type locality: British East Africa.

Rhodesia: Victoria Falls (G. Arnold).

Formicini Forel[1]

Pseudolasius Emery

Pseudolasius Emery, 1887, Ann. Mus. Civ. Genova, XXIV, p. 244.

Formica (part) F. Smith. *Lasius* (part) Mayr.

Genotype: *Formica familiaris* F. Smith, 1860.

1. **Pseudolasius bucculentus** Wm. M. Wheeler. See p. 222 (☿, ♂).

Type locality: Medje, Belgian Congo (Lang and Chapin).

2. **Pseudolasius bufonum** Wm. M. Wheeler. See p. 220 (☿, ♀, ♂).

Type locality: Medje, Belgian Congo (Lang and Chapin).

3. **Pseudolasius gowdeyi** Wm. M. Wheeler. See p. 223 (☿).

Acropyga gowdeyi Gowdey, 1917, Bull. Ent. Research, VIII, pt. 2, p. 187 (without description).

Type locality: Entebbe, Uganda (C. C. Gowdey).

4. **Pseudolasius weissi** Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391, fig. 16 (☿, ♀). Emery, 1911, Ann. Soc. Ent. Belgique, LV, pp. 214 and 219 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

4. Var **sordidus** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿). See p. 219.

Type locality: Aburi, Gold Çoast (F. Silvestri).

Belgian Congo: Akenge (Lang and Chapin).

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[1] Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 62, records *Formica rufibarbis* Fabricius (☿, ♀) as taken by Distant at Pretoria, Transvaal. It would be interesting to know whether this Palearctic ant has really been introduced into South Africa.

Cataglyphis FÖRSTER

Cataglyphis FÖRSTER, 1850, Verh. Naturh. Ver. Preuss. Rheinl., VII, p. 493.

Monocombus MAYR, 1855, Verh. Zool. Bot. Ges. Wien, V, p. 381.

Formica (part) FABRICIUS, etc. *Tapinoma* F. SMITH. *Myrmecocystus* EMERY, FOREL, MACCOOK, ERN. ANDRÉ, etc.

Genotype: *Formica megalocola* Förster, ☿, 1850 = *Cataglyphis fairmairei* Förster, ♂, 1850.

1. **Cataglyphis cursor** (BOYER DE FONSCOLOMBE) MAYR, 1861, 'Europ. Formicid.,' p. 45 (☿, ♀, ♂).

Formica cursor BOYER DE FONSCOLOMBE, 1846, Ann. Soc. Ent. France, (2) IV, p. 41 (☿, ♀, ♂); ibid., Bull., p. lxix (♀).

Myrmecocystus cursor EMERY, 1898, Öfvers. Finsk. Vet.-Soc. Förh., XL, p. 147, footnote (♀).

Type locality: Aix, FRANCE (Boyer de Fonscolombe).

SOUTHERN EUROPE, ANATOLIA, and CENTRAL ASIA. Emery (*loc. cit.*) records it from the GOLD COAST.

2. **Cataglyphis viaticus** (FABRICIUS) MAYR, 1861, 'Europ. Formicid.,' p. 45 (☿, ♀, ♂). RADOSZKOWSKY, 1876, Hor. Soc. Ent. Rossicæ, XII, p. 140. EMERY, 1877, Ann. Mus. Civ. Genova, IX, p. 366 (☿, ♀).

Formica viatica FABRICIUS, 1787, 'Mantissa Insect.,' I, p. 308 (☿).

Myrmecocystus viaticus EMERY, 1880, Ann. Mus. Civ. Genova, XV, p. 389 (☿). MAGRETTI, 1884, ibid., XXI, p. 537 (☿). FOREL, 1894, Journ. Bombay Nat. Hist. Soc., VIII, p. 402.

Type locality: SPAIN (Vahl).

EASTERN EUROPE, NORTH AFRICA, WESTERN and CENTRAL ASIA, NORTHERN INDIA. EGYPT. ABYSSINIA: Harar (Ilg). ANGLO-EGYPTIAN SUDAN: Sebderat; Kassala (Magretti). ERITREA: Keren; Sciotel; Anseba (Beccari); Sogodas (Magretti).

2*a*. Subsp. **abyssinicus** (FOREL).

Myrmecocystus viaticus subsp. *abyssinicus* FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 382 (☿, ♀).

Type locality: Ingfal, ABYSSINIA (Kachovskij).

ABYSSINIA: Schoa; western Abyssinia (Ilg).

2*b*. Subsp. **adenensis** (FOREL).

Myrmecocystus viaticus subsp. *adenensis* FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 382, footnote (☿).

Type locality: Aden, southern ARABIA (F. Ris).

2*c*. Subsp. **bicolor** (FABRICIUS).

Formica bicolor FABRICIUS, 1793, 'Ent. Syst.,' II, p. 351 (♂). LATREILLE, 1802, 'Hist. Nat. Fourmis,' p. 173 (♂). FABRICIUS, 1804, 'Syst. Piez.,' p. 398 (♂).

Myrmecocystus viaticus var. *desertorum* FOREL, 1894, Journ. Bombay Nat. Hist. Soc., VIII, p. 402 (☿); 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. EMERY, 1895, Ann. Mus. Civ. Genova, XXXV, p. 180.

Myrmecocystus viaticus subsp. *desertorum* K. ESCHERICH, 1902, Allgem. Zeitschr. Ent., VII, p. 354. MAYR, in Jagerskiöld, 1903, 'Exped., IX, Formicid.,' p. 10.

Myrmecocystus bicolor MAYR, 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 389.

Myrmecocystus viaticus subsp. *bicolor* FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 450.

Cataglyphis bicolor EMERY, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 22 (☿, ♂).

Type locality: BARBARY (Desfontaines).

ALGERIAN SAHARA. EGYPT. ANGLO-EGYPTIAN SUDAN: Edeloud in the Kordofan Desert (F. Werner); Gebelein (I. Trägårdh). ERITREA: Mayabal; Nefasit (F. Silvestri). ABYSSINIA: southern Abyssinia (Ilg); Ogaden (V. Bottego). SOMALILAND: wells of Laffarugh to wells of Aberio (V. Bottego). GOLD COAST (doubtful record).

2c_1. Var. **congolensis** (STITZ).

Myrmecocystus bicolor var. *congolensis* STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 396, fig. 10 (☿).

Type locality: Fort Archambault, FRENCH CONGO (Schubotz).

2*d*. Subsp. **setipes** (FOREL).

Myrmecocystus viaticus subsp. *setipes* FOREL, 1894, Journ. Bombay Nat. Hist. Soc., VIII, p. 401 (☿).

Type locality: Nusseerabad, INDIA (Glardon).

2d_1. Var. **seticornis** (EMERY).

Myrmecocystus viaticus subsp. *setipes* var. *seticornis* EMERY, 1898, Öfvers. Finsk. Vet. Soc. Forh., XL, p. 147, footnote (☿).

Type locality: GOLD COAST.

Œcophyllini Forel

Œcophylla F. SMITH

Œcophylla F. SMITH, 1861, Journ. Proc. Linn. Soc. London, Zool., V, p. 101.

Formica (part) FABRICIUS, *et auct.* *Myrmica* (part) HEER.

Genotype: *Formica smaragdina* Fabricius, 1775.

1. **Œcophylla longinoda** (LATREILLE) GERSTÆCKER, 1871, Arch. f. Naturg., XXXVII, 1, p. 354; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 343 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 176. H. KOHL, 1906, Natur u. Offenbarung, LII, pp. 166–167; 1909, ibid., LV, p. 169. WASMANN, 1911, 1er Congr. Intern. Entom. Bruxelles (1910), II, Mém., p. 231; 1913, Ann. Rept. Smiths. Inst. for 1912, p. 472. FOREL, 1913, Rev. Zool. Afr., II, p. 339 (♀). See p. 227.

Formica longinoda LATREILLE, 1802, 'Hist. Nat. Fourmis,' p. 184 (☿), Pl. XI, fig. 72.

Echophylla virescens RADOSZKOWSKY, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 197.

Œcophylla brevinodis ERN. ANDRÉ, 1890, Rev. d'Ent. Caen, IX, p. 313 (☿). STITZ, 1913, Mitt. Zool. Mus. Berlin, V, p. 148 (☿). SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 345 (☿, ♀).

Œcophylla smaragdina subsp. *longinoda* EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 564 (☿, ♀). FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. ERN. ANDRÉ, 1895, Rev. d'Ent. Caen, XIV, p. 2 (☿, ♀). MAYR, 1896, Ent. Tidskr., XVII, p. 249. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿). H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 39. EMERY, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500 (☿, ♀). MAYR, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 18. Forel, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 15 (♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 391. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, pp. 54 (☿, ♀), 61 (☿), and 73 (☿, ♀); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 148 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿, ♂). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 378 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 444. Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 396 (☿).

Œcophylla longinoda var. *brevinodis* Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 176.

Œcophylla smaragdina var. *longinoda* L. Reh, 1905, Zeitschr. f. Pflanzenkrankh., XV, p. 135. Aulmann and La Baume, 1912, 'Fauna d. Deutsch. Kolon.,' V, 3, p. 65, fig. 37. Aulmann, 1913, ibid., V, 5, p. 95, fig. 80. Forel, 1913, Rev. Suisse Zool., XXI, p. 670 (♀, ♂).

Œcophylla smaragdina subsp. *longinoda* var. *brevinoda* Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 345 (☿, ♀).

Œcophylla smaragdina subsp. *brevinodis* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 396 (☿).

Type locality: Senegal.

Senegambia: Dakar (F. Silvestri). Gambia: Bathurst (C. Alluaud). French Guinea: Kindia (F. Silvestri). Sierra Leone: (Mocquerys). Liberia. Ivory Coast: Grand Bassam (Lohier; Bonet); Assinie (C. Alluaud). Gold Coast. Slave Coast. Southern Nigeria: Oni Camp, east of Lagos (Lamborn). Cameroon: (Sjöstedt; Conradt); Bibundi (Tessmann); Molundu (Reichensperger); Victoria (Winkler). Spanish Guinea: Alen (Tessmann). French Congo: Ogowe (Mocquerys); Brazzaville; Madingu (A. Weiss); Fort Crampel (Schubotz); Boda. Belgian Congo: Duma (Schubotz); Kondué; Sankuru (Luja); Mondombe (R. Mayné); Leopoldville to Stanleyville (Weyns); Mayombe (de Briey); Banana (Busschodts); Kinshasa (Waelbroeck); Malela; Faradje (Lang and Chapin); Katala (J. Bequaert); Boma. Angola: (Welwitsch); San Antonio (Lang and Chapin). German East Africa: Tanga (Sjöstedt). British East Africa: Mombasa (v. d. Decken). Zanzibar: (Stuhlmann; Voeltzkow). Portuguese East Africa: Delagoa (Liengme). Abyssinia: Buditu to Dimé; Dimé to Bass Narok (V. Bottego).

1_1. Var. **annectens** Wm. M. Wheeler. See p. 230 (☿, ♀, ♂).

Type locality: Avakubi, Belgian Congo (Lang and Chapin).

Belgian Congo: Stanleyville; Niangara (Lang and Chapin); Malela (J. Bequaert).

1_2. Var. **fusca** (Emery). See p. 231.

Œcophylla fusca Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 496 (☿, ♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 148 (☿); 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 396 (☿).

Œcophylla smaragdina subsp. *fusca* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354.

Type locality: Cameroon (Conradt).

Liberia: Monrovia (J. Morris). Nigeria. Spanish Guinea: Alen (Tessmann). Belgian Congo: Stanleyville; Garamba (Lang and Chapin); Duma (Schubotz).

1_3. Var. **rubriceps** (Forel). See p. 231.

Œcophylla smaragdina subsp. *fusca* var. *rubriceps* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿).

Type locality: BELGIAN CONGO.

BELGIAN CONGO: Stanleyville (Lang and Chapin).

1. Var. **textor** (SANTSCHI).

Œcophylla smaragdina subsp. *longinoda* var. *textor* SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 128, fig. 29a (☿, ♀).

Type locality: Mangapwani, ZANZIBAR ISLAND (Alluaud and Jeannel).

ZANZIBAR ISLAND: Bububu (Alluaud and Jeannel). BRITISH EAST AFRICA: Likoni; Cheteni; Tiwi; Gazi near Mombasa (Alluaud and Jeannel).

2. **Œcophylla smaragdina** (FABRICIUS) F. SMITH, 1861, Journ. Proc. Linn. Soc. London, Zool., V, p. 102 (☿). MAYR, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 695; 1863, ibid., XIII, p. 438; 1867, Tijdschr. v. Ent., X, p. 70 (☿, ♀). FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 199 (♂). EMERY, 1887, Ann. Mus. Civ. Genova, XXIV, p. 242 (☿, ♀); 1888, Zeitschr. Wiss. Zool., XLVI, p. 379, Pl. XXVII, fig. 7. ROTHNEY, 1889, Trans. Ent. Soc. London, p. 358. EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 564 (☿, ♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 177. MAYR, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197. H. STADELMANN, 1893, Mitth. Deutsch. Schutzgeb., VI, p. 217. EMERY, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 112 (☿, ♀). BINGHAM, 1903, 'Fauna Brit. India, Hym.,' II, p. 311, fig. 93 (☿, ♀, ♂); 1903, Ann. Mag. Nat. Hist., (7) XII, p. 62 (♂). FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371; 1913, Rev. Zool. Afr., II, p. 339 (☿). BEQUAERT, ibid., p. 430. CARPENTER, 1920, 'A Naturalist on Lake Victoria,' pp. 100 and 283.

Formica smaragdina FABRICIUS, 1775, 'Syst. Ent.,' p. 828 (♀); 1781, 'Spec. Insect.,' I, p. 488 (♀); 1787, 'Mantissa Insect.,' I, p. 307. GMELIN, in Linnæus, 1790, 'Syst. Nat.,' Ed. 13, I, 5, p. 2797. CHRIST, 1791, 'Naturg. d. Insect.,' p. 505, Pl. LX, fig. 1. OLIVIER, 1791, 'Encycl. Méthod. Insect.,' VI, p. 491. FABRICIUS, 1793, 'Ent. Syst.,' II, p. 350 (♀). LATREILLE, 1802, 'Hist. Nat. Fourmis,' p. 176 (♀), Pl. III, fig. 18. FABRICIUS, 1804, 'Syst. Piez.,' p. 397. LEPELETIER, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 218. JERDON, 1851, Madras Journ. Litt. Sc., XVII, p. 121 (☿, ♀, ♂); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 104 (☿, ♀, ♂). F. SMITH, 1857, Journ. Proc. Linn. Soc. London, Zool., II, p. 53; 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 17, Pl. III, fig. 3. TENNENT, 1861, 'Sketch Nat. Hist. Ceylon,' p. 422.

Formica macra GUÉRIN, in Duperrey, 1830, 'Voy. Coquille, Zool.,' II, 2, p. 202 (☿); Atlas, Ins., Pl. VIII, fig. 1.

Formica zonata GUÉRIN, ibid., p. 205 (♀).

Œcophylla smaragdina var. *longinoda* EMERY, 1887, Ann. Mus. Civ. Genova, XXIV, p. 243 (*nec* Latreille).

Type locality: INDIA.

Indomalayan and Papuan Regions.

The occurrence of this species in the Ethiopian Region is doubtful. It was recorded from the following African localities, but the specimens in question may have been *longinoda*:

BELGIAN CONGO: Bukama (J. Bequaert). BRITISH EAST AFRICA: Mombasa (H. Prell); Pemba Island (Burtt). GERMAN EAST AFRICA: Mafia Island (Voeltzkow); Amani; Ulenge (Zimmer). ZANZIBAR (Stuhlmann). PORTUGUESE EAST AFRICA: Inhambane; Magnarra River (Fornasini). UGANDA: Ngamba Island, Victoria Nyanza (Carpenter).

Camponotini Forel

Camponotus Mayr[1]

Camponotus Mayr, 1861, 'Europ. Formicid.,' p. 35.
Formica (part) Linnæus, etc.
Genotype: *Formica herculeana* Linnæus, 1758.

Subgenus 1. **Myrmoturba** Forel

Camponotus subg. *Myrmoturba* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 91; 1914, Rev. Suisse Zool., XXII, p. 259. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 235.

Subgenotype: *Formica maculata* Fabricius, 1781.

1. **Camponotus (Myrmoturba) acvapimensis** Mayr.

Camponotus acvapimensis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 664 (☿); 1863, ibid., XIII, p. 397. Roger, 1863, 'Verzeich. Formicid.,' p. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 220. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 20 (♀). See p. 236.

Camponotus acwapimensis Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 365 (☿); 1897, ibid., XXXVIII, p. 604; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

Camponotus aqwapimensis Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 501.

Camponotus akvapimensis L. Reh, 1905, Zeitschr. f. Pflanzenkrankh., XV, p. 134.

Camponotus akwapimensis Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90 (☿, ♀); 1907, Ann. Mus. Nat. Hungarici, V, p. 31 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16 (♀); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 268 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 451 (☿); 1911, Rev. Zool. Afr., I, p. 281 (♀); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) LXVII, p. 371 (☿). Aulmann and La Baume, 1912, 'Fauna d. Deutsch. Kolon.,' V, 3, p. 65. Aulmann, 1913, ibid., V, 5, p. 95. Bequaert, 1913, Rev. Zool. Afr., II, p. 430. Farquharson, 1914, Trans. Ent. Soc. London, Proc., p. xxiv.

Camponotus (*Myrmoturba*) *akwapimensis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 145 and 355 (☿, ♀); 1913, Rev. Zool. Afr., II, p. 340 (☿, ♀, ♂); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 253 (☿, ♂).

Camponotus (*Myrmoturba*) *acwapimensis* Forel, 1914, Revue Suisse Zool., XXII, p. 266. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 380 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 442 (☿, ♀).

Camponotus mombassæ Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 180 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 119 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 243. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 181. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37.

Camponotus kersteni subsp. *mombassæ* Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

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[1] *Camponotus angolensis* "Smith," recorded from Angola (Welwitsch) by Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 197, has apparently never been described. Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 336, mention *Camponotus marginatus* (Latreille) as taken by them at Johannesburg, Transvaal; but this record is probably due to misidentification, since this is a holarctic species.

Camponotus (Myrmoturba) ackwapimensis Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Akwapim Mountains, Gold Coast.

French Guinea: Kindia; Camayenne; Mamou (F. Silvestri); Los Islands. Sierra Leone. Liberia: Grand Bassa; Junk River (H. Brauns). Southern Nigeria: Moor Plantation near Ibadan (Farquharson); Old Calabar (H. Brauns). Cameroon: (H. Brauns); Victoria (Fickendey). Belgian Congo: Banza Masola; Ganda Sundi; Mondombe; Congo da Lemba (R. Mayné); Yumbi; Zambi (J. Bequaert); Faradje; Garamba; Bolengi near Coquilhatville; Stanleyville; Vankerckhovenville; Akenge; Niangara (Lang and Chapin); Thysville (Lang, Chapin, and J. Bequaert); Eala. Rhodesia: Bulawayo (G. Arnold). German East Africa: Kigerama; Mombasa (Hildebrandt; H. Prell); Tanga (Zimmer); Mto-ya-Kifaru (Katona); Kilimanjaro (Sjöstedt); Patta; Manda. Uganda: Chacansengula (Bayer). British East Africa: Fundu Island, W. Pemba (Voeltzkow). Somaliland: Lower Ganana (V. Bottego); Giari Bulé (Ruspoli); between Obbia and Berbera (Briechetti-Robecchi). Abyssinia: Arussi Galla, Ganale Gudda; Dimé to Bass Narek (V. Bottego); Bela; Coromma (Ruspoli); western Abyssinia (Ilg). Eritrea: Keren (Beccari); Asmara; Keren (Mancini and Ruggeri).

1_1. Var. **poultoni** (Forel).

Camponotus akwapimensis var. *poultoni* Forel, 1913, Rev. Zool. Afr., II, p. 353 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 444. Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 348 (☿, ♂).

Camponotus (Myrmoturba) acwapimensis var. *pultoni* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 380 (☿).

Camponotus (Myrmoturba) acwapimensis var. *poultoni* Forel, 1916, Rev. Suisse Zool., XXIV, p. 442 (☿).

Type locality: Lagos, Southern Nigeria (Lamborn).

Sierra Leone. Cameroon: Victoria (F. Silvestri). Belgian Congo: St. Gabriel (Kohl); Congo da Lemba (R. Mayné).

2. **Camponotus (Myrmoturba) arnoldinus** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 251 (☿).

Type locality: Durban, Natal (G. Arnold).

3. **Camponotus (Myrmoturba) belligerum** Santschi.

Camponotus belligerum Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 384, fig. 15 (☿).

Type locality: Ababis, German Southwest Africa (G. Arnold).

4. **Camponotus (Myrmoturba) bianconii** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus bianconii Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 52 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Type locality: Cape Town, Cape Province (E. Simon).

5. **Camponotus (Myrmoturba) cleobulus** Santschi, 1919, Rev. Zool. Afr., VI, p. 238 (☿).

Type locality: Drakensberg, Natal, 11,000 ft. (Haviland).

6. **Camponotus (Myrmoturba) maculatus** (Fabricius). Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Donisthorpe, 1915, Ent. Record, XXVII, p. 221 (♀). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255. See pp. 234 and 1040.

Formica maculata Fabricius, 1781, 'Spec. Ins.,' I, p. 491 (☿); 1787, 'Mantissa Insect.,' I, p. 308 (☿). Gmelin, in Linnæus, 1790, 'Syst. Nat.,' Ed. 13, I, 5, p. 2800. Olivier, 1791, 'Encycl. Méthod. Insect.,' VI, p. 495. Fabricius, 1793, 'Ent. Syst.,' II, p. 356 (☿). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 283. Fabricius, 1804, 'Syst. Piez.,' p. 403 (☿). Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 215 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 28 (☿).

Camponotus maculatus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 654 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 241. Emery, 1915, Bull. Soc. Ent. France, p. 79.

Camponotus maculatus maculatus Emery, 1905, Rend. Accad. Sc. Bologna, (1904-05), p. 37; 1908, Deutsch. Ent. Zeitschr., pp. 190 and 191 (♃, ☿, ♀, ♂).

Type locality: "in Africa æquinoctiali" (probably Sierra Leone).

Belgian Congo: Medje; Yakuluku; Garamba; Vankerckhovenville; Faradje (Lang and Chapin).

The distribution of the typical form cannot be traced at present. Probably one of the subspecies or varieties listed below is a synonym of it; perhaps such is the case for *C. maculatus* subsp. *melanocnemis* var. *lohieri* Santschi.

The following references of "*Camponotus maculatus*" probably include some of the forms and not the type.

Formica maculata Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262; in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 509 (☿). A. Girard, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 227; in Capello and Ivens, 1882, 'From Benguella to the Territory of Yacca,' II, p. 294.

Camponotus maculatus Roger, 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 400; 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 27. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355; 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 344 (☿, ♀). Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 364 (☿, ♀, ♂). W. F. Kirby, 1884, Ann. Mag. Nat. Hist., (5) XIII, p. 404. Emery, 1890, Bull. Soc. Ent. Italiana, XXII, p. 56; 1892, Ann. Soc. Ent. France, LX, (1891), p. 566. Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 349 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 119 (☿). Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 46; 1895, Ann. Mus. Civ. Genova, XXXV, p. 180; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768 (☿, ♀); 1896, Ann. Mus. Civ. Genova, XXXVII, p. 158 (☿, ♂); 1897, ibid., XXXVIII, p. 604. H. Stadelmann, 1898, 'Deutsch Ost-Afrika,' IV, Hym., p. 36. Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 501. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 62 (☿, ♀, ♂). Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 11; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 389; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 19 (☿, ♀). Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 31 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16 (☿). F. F. Kohl, 1907, Denkschr. Ak. Wiss. Wien, LXXI, p. 282 (☿, ♀). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 310, 320, 327, 336, 341, 363, and 369. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 148 (☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 26 (☿, ♀, ♂); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907-08),' III, p. 392 (☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿); 1913, Rev. Zool. Afr., II, p. 340 (♀). Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, pp. 198 and 215.

Camponotus sylvaticus subsp. *maculatus* Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 64.

Camponotus sylvaticus Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 525 (☿, ♀). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿, ♀). Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 62 (☿, ♀).

Camponotus sylvaticus var. *maculatus* Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿, ♀); 1884, Ann. Mus. Civ. Genova, XXI, p. 536 (☿, ♀). Longstaff, 1911, Ent. Monthly Mag., XLVII, p. 124 (☿).

Camponotus rubripes subsp. *maculatus* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 149.

Camponotus (*Myrmoturba*) *maculatus* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿). Santschi, 1914, Bull. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿, ♀); 1914, Deutsch. Ent. Zeitschr., p. 288 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 129 (☿, ♂). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 403 (☿).

Camponotus maculatus subsp.? Lamborn, 1914, Trans. Ent. Soc. London, (1913), p. 444.

Senegambia: Dakar (C. Alluaud); Thiès (F. Silvestri). Southern Nigeria: Oni Camp east of Lagos (Lamborn). Cameroon: Duala (v. Rothkirch). French Congo: Fort Archambault (Schubotz). Belgian Congo: Kiambi (J. Bequaert); Kasindi (Schubotz). Rhodesia: (G. Arnold); Sheshong Road Station (Dixey and Longstaff). Bechuanaland: Khakhea (L. Schultze); Artesia (Dixey and Longstaff). German Southwest Africa: (Lübbert; Kunze); Okahandja (Casper; Dinter). Cape Province: (Wilms); Cape Town; Kimberley (E. Simon); King William's Town (R. Godfrey); East London (Dixey and Longstaff). Orange Free State: Bloemfontein (E. Simon). Transvaal: Makapan; Hamman's Kraal (E. Simon); Pretoria (Distant); Hebron (E. Simon); Barberton (Rendall); Lydenburg (Wilms); Johannesburg (Dixey and Longstaff; Distant). Natal: The Bluff, Durban; Sydenham, Durban (Dixey and Longstaff). Mozambique: (Peters). Zanzibar: (Stuhlmann); Bawi Island near Zanzibar (Stuhlmann). German East Africa: Kilimanjaro (Bornemisza); Ulenge Island (H. Prell); Buiko; Uluguru Mts. (Zimmer); Meru (Sjostedt); Tanga (Alluaud and Jeannel). British East Africa: Mombasa (v. d. Decken; Alluaud and Jeannel); Shimoni; Tiwi (Alluaud and Jeannel); Lamu Island; Fundu Island near Pemba; Manda Island; Patta Island (Voeltzkow). Somaliland: (C. Keller); Obbia (Bricchetti-Robecchi); Milmil (Pavesi); wells of Laffarugh to wells of Aberio (V. Bottego); Magala Re Umberto (Ruspoli); Lugh; Matagoi to Lugh (V. Bottego). Abyssinia: Ganale; Bela; Daua; Ogaden (Ruspoli); Webi (Bricchetti-Robecchi); Saneurar to Amarr Burgi; Lake Bass Narok (V. Bottego). Eritrea: Massaua; Assab (Doria and Beccari); Ghinda (K. Escherich). Anglo-Egyptian Sudan: Kaka, White Nile (I. Trägårdh); Assuan; Khor Attar; Gondokoro (F. Werner); Metemma; Kassala; Sebderat (Magretti); Khartum (Longstaff). Sokotra: Ras Shoab. Southern Arabia: Aden (O. Simony); Gischin (W. Hein).

6j. Var. **thomensis** Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 3 (☿, ♀, ♂).

Type locality: San Thomé (de Seabra).

6*a*. Subsp. **adenensis** Emery, 1893, Ann. Soc. Ent. France, LXII, p. 257 (☿, ♀); 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604.

Type locality: Aden, southern Arabia (E. Simon; Doria; C. Alluaud).

Abyssinia: Salole (Ruspoli).

6*a*$_1$. Var. **assabensis** Emery, 1893, Ann. Soc. Ent. France, LXII, p. 258 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768.

Type locality: Assab, Eritrea.

6*b*. Subsp. **ægyptiacus** Emery, 1915, Bull. Soc. Ent. France, p. 79; 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 22 (☿).

Type locality: Egypt.

Eritrea.

6*c*. Subsp. **agricola** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 454 (☿).

Type locality: Mountains of Natal (R. C. Wroughton).

6*c*$_1$. Var. **tacitus** Santschi, 1919, Rev. Zool. Afr., VI, p. 240 (☿).

Type locality: Natal (Haviland).

6*d*. Subsp. **atramentarius** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 180. Lichtwardt, 1908, Deutsch. Ent. Zeitschr., p. 338. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 26 (☿, ♀); 1911, Rev. Zool. Afr., I, p. 280 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 131 (☿). Buchner, 1918, Arch. Microsc. Anat., XCI, Abt. 2, p. 78, footnote.

Camponotus maculatus var. *atramentarius* Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 379 (☿).

Type locality: Abyssinia (Dmitriev).

Natal: Durban (Wilms). Mozambique: Lobombo Borges (Wilms). Belgian Congo: Uele-Bili. Uganda: M'Bale (C. Alluaud). Benguela (C. Wellman).

6*d*$_1$. Var. **cluis** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 67 (☿); 1911, Rev. Zool. Afr., I, p. 280 (☿).

Type locality: Benguela (C. Wellman).

East Africa (between the Great Lakes).

6*d*$_2$. Var. **cluisoides** (Forel).

Camponotus maculatus var. *cluisoides* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 354 (☿).

Type locality: Campo Tembo, Tsavo, British East Africa (Bayer).

6*e*. Subsp. **brutus** (Forel) Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150 (♂); 1896, Ent. Tidskr., XVII, p. 249. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769; 1899, Ann. Soc. Ent. Belgique, XLIII, p. 501 (☿). Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 69 (☿). Sjöstedt, 1904, 'I Västafrikas Urskogar,' p. 507. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (♀). Santschi, 1910, Ann Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 148 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 280 (♀); 1913, ibid., II, p. 340 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿, ♀, ♂); 1914, Rev. Suisse Zool., XXII, p. 267. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 403 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 442 (☿, ♀, ♂). Buchner, 1918, Arch. Microsc. Anat., XCI, Abt. 2, p. 78, footnote. See p. 236.

Camponotus rubripes subsp. *brutus* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 155 (☿, ♀).

Camponotus brutus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223. L. Reh, 1905, Zeitschr. f. Pflanzenkrankh., XV, p. 134 (☿). Aulmann and La Baume, 1912, 'Fauna d. Deutsch. Kolon.,' V, 3, p. 62. Aulmann, 1913, ibid., V, 5, p. 92.

Camponotus (Myrmoturba) brutus Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Chinchoxo, Portuguese Congo (Falkenstein).

Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Liberia. Fernando Po: (Schultze). Cameroon: (Sjöstedt; H. Brauns); Victoria (F. Silvestri; H. Winkler); Mundame (Conradt); Nssanakang (Rudatis); Bibundi; Mokundange (Tessmann); Yukaduma (Schultze). Spanish Guinea: Alen (Tessmann). French Congo: Brazzaville (A. Weiss); Sibange; Sette-Cama (Soyaux; Hupfer). Belgian Congo: (Kohl); Yabena Mabote, Lomami; Kondué (Luja); Lukula (Daniel); Beni (Borgerhoff); Dungu, Mayombe (Deleval); Kiniati; Congo da Lemba (R. Mayné); Mayombe (de Briey); Avakubi; Medje; Faradje; Bafwasende; Stanleyville; Batama; Lukolela; Malela; Isangi; Nouvelle Anvers; Zambi; Poko; Akenge; Niangara (Lang and Chapin); Malela (J. Bequaert); Kimuenza (Schultze); Libenge (Schubotz).

6e₁. Var. **lycurgus** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 501 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿). See p. 236.

Type locality: Cameroon.

Ivory Coast. French Congo: Brazzaville (A. Weiss); Ogowe. Belgian Congo: Leopoldville (Lang and Chapin).

6f. Subsp. **cavallus** Santschi, 1911, Rev. Zool. Afr., I, p. 211 (☿, ♀). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 403 (☿). Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 347, fig. 4b (☿).

Type locality: Cucala, Benguela (J. Cruchet).

Belgian Congo: Duma (Schubotz).

6g. Subsp. **cognatus** (F. Smith) Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (☿). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿). Mayr, 1896, Ent. Tidskr., XVII, p. 249. Forel, in Schultze, 1910, 'Forschungsreise in Sudafrika,' IV, p. 26 (☿, ♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 148 (☿).

Formica cognata F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 35 (☿).

Camponotus rubripes Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 129 (☿, ♀, ♂); 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 401. Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 143.

Camponotus sylvaticus subsp. *cognatus* Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 65.

Camponotus sylvaticus subsp. *cognatus* var. *rubripes* Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 66 (☿).

Camponotus sylvaticus var. *cognatus* Magretti, 1884, Ann. Mus. Civ. Genova, XXI, p. 536 (☿); 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿).

Camponotus rubripes subsp. *cognatus* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 151; 1890, ibid., XXXIII, C. R., p. lv (☿).

Camponotus maculatus var. *cognatus* Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 36. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 215 (☿, ♂).

Camponotus cognatus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 225. Wasmann, 1899, Deutsch. Ent. Zeitschr., p. 411. Bergroth, 1915, Wien. Ent. Zeitg., XXXIV, p. 201.

Camponotus maculatus subsp. *carinatus* var. *cognatus* Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 112 (☿, ♀); 1895, Ann. Soc. Ent. France, LXIV, p. 46.

Type locality: Port Natal, Natal.

Ivory Coast: Assinie (C. Alluaud). Togo: Bismarckburg (Conradt). Fernando Po: (Conradt). French Congo: Ogowe (Mocquerys). German Southwest Africa: (Lübbert). Cape Province: Kamaggas; Cape Flats, Bergvliet (L. Schultze); Cape Town (E. Simon); Port Elizabeth (H. Brauns). Mozambique: Inhambane (Fornasini); Quilimane (Stuhlmann). Uganda: Sanda; Katende; Mitiana; Butiti (Duke of Abruzzi). Anglo-Egyptian Sudan: Suakin; Kor Langhebb (Magretti).

$6g_1$. Var. **ballioni** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27.

Camponotus maculatus subsp. *ballioni* Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 176 (☿).

Type locality: Cape of Good Hope.

Cape Province: Port Elizabeth (H. Brauns).

$6g_2$. Var. **boerus** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27 (☿, ♀).

Type locality: Steinkopf, Cape Province (L. Schultze).

Cape Province: Kamaggas (L. Schultze).

6h. Subsp. **congolensis** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 499, fig. (☿, ♀). Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 69 (♀); 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (☿, ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀). Forel, 1913, Rev. Zool. Afr., II, p. 340 (☿, ♀, ♂). Bequaert, ibid., p. 430. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿). Buchner, 1918, Arch. Microsc. Anat., XCI, Abt. 2, p. 78, footnote. See p. 235.

Type locality: Banana, Belgian Congo (Busschodts).

West Africa: (H. Freyschmidt). Liberia: Cape Mesurado. French Congo: Brazzaville (A. Weiss). Belgian Congo: Kinshasa (Waelbroeck); Boma Sundi (Rollin); Kisantu (J. Bequaert); Beni (Borgerhoff); Yakuluku; Garamba; Faradje; Medje; Niangara (Lang and Chapin). Rhodesia: Bindura (G. Coqhill).

6i. Subsp. **desantii** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 280, figs. 14a–c (☿, ♀, ♂).

Type locality: Kouandé, Upper Dahomey (Desanti).

6j. Subsp. **fornasinii** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 46 (☿); 1896, Mem. Accad. Sc. Bologna, (5) L, p. 769. Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 288 (☿).

Camponotus (Myrmoturba) fornasinii Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Delagoa Bay, Portuguese East Africa.

Natal: (Bates).

6k. Subsp. **guttatus** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 498 (☿, ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿). Forel, 1913, Rev. Suisse Zool., XXI, p. 670 (☿, ♀, ♂). See p. 234.

Type locality: Cameroon (Conradt).

French Congo: Brazzaville (A. Weiss). Belgian Congo: Zambi (Lang, Chapin, and J. Bequaert).

6l. Subsp. **hannæ** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 349, fig. 4a (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

6m. Subsp. **hieroglyphicus** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 290 (☿, ♀).

Type locality: Caconda, Benguela (J. Cruchet).

6n. Subsp. **importunus** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 288 (☿, ♀, ♂).

Camponotus maculatus subsp. *sexpunctatus* var. *importunus* Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27 (☿).

Type locality: Cape Province (Krebs).

Cape Province: Matjesfontein (Wilms); Algoa Bay; Port Elizabeth (H. Brauns). Mozambique: Lobombo Borges (Wilms).

6o. Subsp. **intonsus** Emery, 1905, Rend. Accad. Sc. Bologna, N. S., IX, p. 29, footnote (☿).

Type locality: Cape Province.

Transvaal.

6p. Subsp. **kersteni** (Gerstæcker) Forel, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 309 (☿); 1914, Rev. Suisse Zool., XXII, p. 267.

Camponotus kersteni Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355 (☿); 1873, in 'v. d. Decken's Reisen in Ost-Afrika, Gliederthiere,' p. 344 (☿; *nec* ♂). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37.

Camponotus kerstenii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 237.

Camponotus (*Myrmoturba*) *kersteni* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 131 (♃, ☿, ♀, ♂). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Mt. Kilimanjaro, 8000 ft., German East Africa (v. d. Decken).

German East Africa: Mt. Kilimanjaro, 2740–3000 m. (C. Alluaud). Dalla Torre's record "Zanzibar" is erroneous.

6q. Subsp. **lacteipennis** (F. Smith) Emery, 1896, Mem. Accad. Sc. Bologna, (5) L, p. 768. Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Formica lacteipennis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 34 (☿, ♀, ♂). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 416.

Camponotus lacteipennis Roger, 1863, 'Verzeich. Formicid.,' p. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 237.

Camponotus sylvaticus subsp. *lacteipennis* Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 355.

Camponotus (*Myrmoturba*) *lacteipennis* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Port Natal, Natal.

Transvaal: Makapan; Pretoria (E. Simon).

6r. Subsp. **liengmei** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿, ♀); 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 69 (☿, ♀); 1914, Rev. Suisse Zool., XXII, p. 267; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿).[1]

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[1] Santschi (1921) removes this to *Dinomyrmex*, in which case it should be treated as a variety of *C. sexpunctatus* Forel, as originally described.

Camponotus sexpunctatus var. *liengmei* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 67 (☿).

Camponotus maculatus subsp. *sexguttatus* var. *liengmei* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 46.

Camponotus maculatus subsp. *sexpunctatus* var. *liengmei* Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769.

Camponotus maculatus var. *liengmei* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿, ♂).

Type locality: Delagoa Bay, Portuguese East Africa (Liengme).

Natal: Durban (G. Arnold). Transvaal: Pretoria (E. Simon). Cape Province: Kimberley (E. Simon); Algoa Bay (H. Brauns). British East Africa: Fundu Island, W. Pemba (Voeltzkow). Zanzibar: (Voeltzkow).

$6r_1$. Var. **hansingi** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 452 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 288; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿).

Type locality: Beira, Portuguese East Africa (H. Hansing).

Orange Free State: Reddersburg (H. Brauns). Cape Province: Willowmore (G. Arnold).

$6r_2$ Var. **importunoides** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿).

Type locality: Smithwinkle Bay, Cape Province (E. P. Phillips).

$6s$. Subsp. **manzer** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 452 (☿); 1911, Rev. Zool. Afr., I, p. 280 (☿?). Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 509 (☿, ♂).

Type locality: Victoria Falls, Rhodesia (R. C. Wroughton; G. Arnold).

German East Africa: Kigerama and Weranjanje, near Kagera (between the great lakes).

$6s_1$. Var. **contaminatus** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 291 (☿).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

$6t$. Subsp. **mathildæ** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿, ♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 130 (☿).

Type locality: Zoutpansberg, 800 m., Transvaal (Rolle).

British East Africa: Kenia Region, 1800–2000 m.; Amboni River, 1800 m. (Alluaud and Jeannel).

$6u$. Subsp. **melanocnemis** (Santschi) Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿). Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 278, fig. 14*d* (☿). See p. 234.

Camponotus maculatus var. *melanocnemis* Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 368 (☿).

Type locality: French Congo (H. Pobeguin).

French Congo: Grand Lahou (H. Pobeguin). Belgian Congo: Ubangi (Augustin); Dungu to Niangara, village of Denge (Hutereau); Faradje; Yakuluku (Lang and Chapin). Natal: Durban (G. Arnold).

$6u_1$. Var. **flavominor** Santschi, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 4, footnote (☿).

Type locality: Kouandé, Upper Dahomey (Desanti).

$6u_2$. Var. **lohieri** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 313 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿, ♀); 1915, Ann. Soc. Ent. France, LXXXIV, p. 279 (☿).

Camponotus (Myrmoturba) maculatus var. *lohieri* Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 22 (☿).

Type locality: Jacqueville, Ivory Coast (Lohier).

Senegal. French Guinea: Konakry (F. Silvestri). Upper Dahomey: Kouandé (Desanti). San Thomé: (Gravier). Eritrea: Asmara (F. Silvestri).

$6u_3$. Var. **schultzei** (Forel) Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 279 (♀).

Camponotus maculatus var. *schultzei* Forel, 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 179 (☿, ♂).

Camponotus (Myrmoturba) maculatus subsp. *schultzei* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 130 (☿).

Type locality: Entebbe, Uganda (Schultze).

Uganda: Western Unyoro, between Hoima and Butiaba; Mt. Ruwenzori, Ibanda, 1400 m. (C. Alluaud). British East Africa: Kisumu, Victoria Nyanza (C. Alluaud).

$6u_4$. Var. **semispicatus** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 279 (☿).

Camponotus (Myrmoturba) maculatus subsp. *mathildæ* var. *semispicata* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 130 (☿).

Type locality: Nairobi, Kikuyu, 1700 m., British East Africa (Alluaud and Jeannel).

British East Africa: Naivasha in the Rift Valley, 1900 m.; Gilgil, 1980 m.; Nakuru, 1280 m.; Kijabé on the Kikuyu Escarpment, 2100 m.; Masai Steppe near Nairobi (Alluaud and Jeannel).

6v. Subsp. **minusculus** Viehmeyer, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 44 (☿, ♀). Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 282, fig. 15a (♃).

Type locality: Manow, Langenburg, German East Africa.

6w. Subsp. **miserabilis** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 281, fig. 15*b* (☿).

Type locality: Kindia, French Guinea (F. Silvestri).

$6w_1$. Var. **pessimus** Wm. M. Wheeler. See p. 235 (☿).

Type locality: Yakuluku, Belgian Congo (Lang and Chapin).

6x. Subsp. **negus** Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 142 (☿, ♀, ♂).

Type locality: Kounhi, southern Abyssinia (de Rothschild).

Abyssinia: Abou; Mt. Zyoual near the Colba River; Uomber (de Rothschild). British East Africa: Rendilé, Mt. Karoli (de Rothschild).

$6x_1$. Var. **beritchi** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 348 (☿).

Type locality: George, Cape Province (H. Brauns).

$6x_2$. Var. **etiennei** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 453 (☿).

Type locality: Banana, Belgian Congo (Etienne).

$6x_3$. Var. **nefassitensis** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 290 (☿, ♀, ♂). Karawaiew, 1911, Rev. Russe Ent., XI, p. 11 (☿, ♀).

Camponotus (*Myrmoturba*) *maculatus* subsp. *negus* var. *nefasitensis* Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Type locality: Nefasit, Eritrea (K. Escherich; F. Silvestri).

Egypt: Port Sudan (Karawaiew).

6*y*. Subsp. **pictiventris** Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 28 (☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27 (☿, ♀).

Type locality: Port Elizabeth, Cape Province (H. Brauns).

Cape Province: Kamaggas (L. Schultze).

$6y_1$. Var. **immaculifrons** Santschi, 1919, Bull Soc. Vaudoise Sc. Nat., (5) LII, p. 349 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

$6y_2$. Var. **octomaculatus** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 452 (☿).

Type locality: Natal, 5300 ft. (R. C. Wroughton).

6z. Subsp. **pulvinatus** Mayr, in Sjöstedt, 1907, 'Kilimandjaro, Meru Exped.,' II, 8, p. 20 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 130 (☿).

Type locality: Kibonoto, Mt. Kilimanjaro, German East Africa (Sjöstedt).

Uganda: Western Unyoro, between Hoima and Butiaba; Lake Albert (C. Alluaud).

6a'. Subsp. **radamoides** (Forel). See p. 1042.

$6a'_1$. Var. **cataractæ** Santschi, 1919, Rev. Zool. Afr., VI, p. 239 (☿).

Type locality: Victoria Falls, Rhodesia (G. Arnold).

$6a'_2$. Var. **diffusus** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), pp. 292 and 293 (☿).

Type locality: Matoppo Hills, Southern Rhodesia (G. Arnold).

Natal: (v. Muralt; I. Trägårdh).

$6a'_3$. Var. **liocnemis** (Emery) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 293 (☿).

Camponotus maculatus subsp. *lacteipennis* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 46 (☿).

Camponotus maculatus subsp. *liocnemis* Emery, 1905, Rend. Accad. Sc. Bologna, N. S., IX, p. 30, footnote (☿).

Camponotus maculatus subsp. *atramentarius* var. *liocnemis* Forel, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16; 1909, Ann. Soc. Ent. Belgique, LIII, p. 54; in Schultze, 1910, 'Forschungsreise in Südafrika,' p. 26 (♀); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿); 1913, Rev. Zool. Afr., II, p. 340 (☿). Bequaert, ibid., p. 430.

Camponotus (*Myrmoturba*) *maculatus* subsp. *liocnemis* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿, ♀).

Camponotus (*Myrmoturba*) *maculatus* subsp. *liochnemis* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 38 (☿, ♀, ♂). Trägårdh, ibid., p. 46.

Type locality: Makapan, Transvaal (E. Simon).

Belgian Congo: Welgelegen (J. Bequaert). Angola: Quifangondo (F. Silvestri). German Southwest Africa: (Lübbert; Casper). Basutoland. Transvaal: Pretoria (E. Simon). Natal: Greymine; Stamford Hill (I. Trägårdh). Zululand: (I. Tragårdh). Mozambique. German East Africa: Buiko.

6a'$_6$. Var. **madecassus** (Emery) Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), pp. 292 and 293 (☿). See p. 1042.

Natal: (I. Tragårdh).

6b'. Subsp. **schereri** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 289 (☿, ♀). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 280.

Type locality: Nebena, Liberia (Scherer).

Southern Nigeria: Olokemeji (F. Silvestri). French Guinea: Kakoulima (F. Silvestri).

6c'. Subsp. **solon** (Forel) Emery, 1896, Mem. Accad. Sc. Bologna, (5) L, p. 769; 1899, Ann. Soc. Ent. Belgique, XLIII, p. 500 (☿, ♀). Forel, 1909, ibid., LIII, pp. 54 (♀) and 73 (☿, ♀). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 452 (♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 255 (☿); 1914, Rev. Suisse Zool., XXII, p. 267; 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 348 (☿); 1916, Rev. Suisse Zool., XXIV, p. 442 (☿). See p. 235.

Camponotus rubripes subsp. *solon* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 152 (☿).

Camponotus solon Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 253.

Camponotus (*Myrmoturba*) *solon* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Malange, Angola (M. Buchner).

Cameroon: Mundame (Conradt). French Congo: Brazzaville (A. Weiss). Belgian Congo: Katanga (Lemaire); Kinshasa (Waelbroeck); Lumbulumbu; St. Gabriel (Kohl); Kimpoko (Büttner); Sankuru (Luja); Nyangwe to Stanleyville (Fauconnet); Boma (Styczinski). Medje; Niangara; Akenge; Bafwabaka (Lang and Chapin).

6c'$_1$. Var. **chilon** Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 68 (☿, ♀); 1911, Sitzb. Bayer. Akad. Wiss., p. 288.

Camponotus (*Myrmoturba*) *maculatus* subsp. *brutus* var. *chilon* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 379 (☿).

Type locality: Senegal.

Senegambia: Thiès (F. Silvestri). Dahomey: (Martiensen). Southern Nigeria: Old Calabar (Bates).

6c'$_2$. Var. **jugurtha** Wm. M. Wheeler. See p. 236 (☿).

Type locality: Batama, Belgian Congo (Lang and Chapin).

6d'. Subsp. **thales** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 453 (☿, ♀, ♂); 1913, ibid., LVII, p. 145 (☿).

Type locality: Basutoland (R. C. Wroughton).

Cape Provinck: Reddersburg (H. Brauns).

6d'$_1$. Var. **empedocles** Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 224 (☿).

Type locality: Salisbury, Southern Rhodesia (G. Arnold).

6e'. Subsp. **thoracicus** (Fabricius).

Formica thoracica Fabricius, 1804, 'Syst. Piez.,' p. 397 (♀). Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 285.

Type locality: Barbary (Stub).

6e'$_1$. Var. **fellah** Emery, 1908, Deutsch. Ent. Zeitschr., p. 194 (☿, ♀, ♂).

Camponotus maculatus subsp. *oasium* var. *fellah* Emery, 1891, 'Explor. Tunisie, Fourmis,' p. 18 (☿).

Camponotus maculatus subsp. *fellah* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 267 (☿).

Type locality: Egypt.

Syria. Western Abyssinia: (Ilg).

$6e'_2$. Var. **incommodus** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿).

Type locality: Cape Province.

$6f'$. Subsp. **trægaordhi** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 38 (☿, ♀, ♂). Trägårdh, ibid., p. 46.

Type locality: Stamford Hill, Natal (I. Trägårdh).

Natal: Durban (I. Trägårdh). Zululand: Dukudu (I. Trägårdh).

$6f'_1$. Var. **muger** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿).

Type locality: Durban, Natal (H. B. Marley).

$6g'$. Subsp. **weissi** Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 368 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

Belgian Congo: Boma (Styczinski).

7. **Camponotus (Myrmoturba) maguassa** Wm. M. Wheeler. See p. 237 (☿).

Type locality: Avakubi, Belgian Congo (Lang and Chapin).

8. **Camponotus (Myrmoturba) natalensis** (F. Smith) Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Formica natalensis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 33 (☿, ♀, ♂). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 418.

Camponotus natalensis Roger, 1863, 'Verzeich. Formicid.,' p. 2. Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 79. Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 355. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 244. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 63 (☿). Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 29 (☿).

Type locality: Port Natal, Natal (R. W. Plant).

West Africa: (Fülleborn). Transvaal: Pretoria (Distant).

8_1. Var. **politiceps** Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 38 (☿).

Type locality: Pietermaritzburg, Natal (I. Trägårdh).

8a. Subsp. **corvus** Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 79 (☿, ♀, ♂). Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 51; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus corvus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 227.

Type locality: Valdezia, Transvaal (P. Berthoud).

Transvaal: Pretoria; Makapan (E. Simon).

$8a_1$. Var. **fulvipes** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 51 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (Myrmoturba) natalensis var. *fulvipes* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 38 (☿, ♀, ♂).

Camponotus (*Myrmoturba*) *natalensis* subsp. *fulvipes* Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Type locality: Makapan, Transvaal (E. Simon).

Zululand: (I. Trägårdh).

8*b*. Subsp. **diabolus** Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 81 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus diabolus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 228.

Camponotus (*Myrmoturba*) *diabolus* Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Type locality: Lessouto, Basutoland (P. Berthoud).

9. **Camponotus** (**Myrmoturba**) **roubaudi** Santschi. Forel, 1913, Rev. Zool. Afr., II, p. 340 (☿); 1914, Rev. Suisse Zool., XXII, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus roubaudi Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 365, fig. (☿).

Type locality: Brazzaville, French Congo (A. Weiss and Roubaud).

Belgian Congo: Beni (Borgerhoff).

9_1. Var. **agonia** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 282 (☿).

Type locality: Lugombe, Belgian Congo (Gérard).

10. **Camponotus** (**Myrmoturba**) **sacchii** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus sacchii Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 501 (☿).

Type locality: Buditu to Dimé, Abyssinia (V. Bottego).

11. **Camponotus** (**Myrmoturba**) **somalinus** Ern. André. Forel, 1914, Rev. Suisse Zool., XXII, p. 267. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 132 (☿). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus somalinus Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 280 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 120. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 253. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 180. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37. Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 500; 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63. Mayr, in Jagerskiold, 1903, 'Exped., IX, Formicid.,' p. 11; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 20. Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿).

Type locality: Somaliland.

Egypt. Somaliland: Magala Re Umberto (Ruspoli); Mogadiscio; Obbia; between Obbia and Berbera (Bricchetti-Robecchi). Abyssinia: Sancurar to Amarr Burgi; Dimé to Bass Narok; Arussi Galla, Ganale Gudda (V. Bottego). Eritrea: Asmara (Mancini and Ruggeri). British East Africa: Taveta; Mombasa (C. Alluaud). German East Africa: Tanga (Zimmer); Mbusini, Usegua (Stuhlmann); Daressalaam (H. Brauns); Kahe; Mt. Kilimanjaro (Sjöstedt).

11_1. Var. **curtior** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 65 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768.

Type locality: Southern Abyssinia (Ilg).

11_2. Var. **pattensis** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Camponotus somalicus var. *pattensis* Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907-08),' III, p. 392 (☿).

Type locality: Patta Island, British East Africa (Voeltzkow).

German East Africa: Bukoba, Victoria Nyanza (Schubotz).

12. **Camponotus (Myrmoturba) werthi** Forel, 1914, Rev. Suisse Zool., XXII, p. 268; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 253 (☿).

Camponotus werthi Forel, 1908, Bull. Soc. Vaudoise Sc. Nat., (5) XLIV, p. 18 (☿). Enderlein, 1909, 'Deutsch. Südpolar-Expedition,' X, 4, pp. 340, 393, and 426 (☿).

Type locality: Kerguelen (Werth); probably imported from the Cape, since it was found in a house only.

Cape Province: Caledon (E. P. Phillips). Crozet Archipelago: Possession Island (Werth).

Subgenus 2. **Dinomyrmex** Ashmead

Dinomyrmex Ashmead, 1905, Canadian Ent., XXXVII, p. 384.

Camponotus subg. *Myrmogigas* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 91.

Camponotus subg. *Dinomyrmex* Forel, 1914, Rev. Suisse Zool., XXII, p. 259. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 236.

Subgenotype: *Formica gigas* Latreille, 1802.

13. **Camponotus (Dinomyrmex) æquatorialis** Roger. Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus æquatorialis Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 135 (☿); 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 458. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 220.

Camponotus maculatus ? subsp. *æquatorialis* Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769.

Camponotus equatorialis Santschi, 1911, Rev. Zool. Afr., I, p. 211 (☿).

Type locality: Gaboon, French Congo.

French Congo: (A. Weiss).

13*a*. Subsp. **kohli** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 349 (☿).

Type locality: Bengamisa, Belgian Congo (Kohl).

14. **Camponotus (Dinomyrmex) brevicollis** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 401, fig. 13 (☿).

Type locality: between Fort de Possel and Fort Crampel, French Congo (Schubotz).

15. **Camponotus (Dinomyrmex) cæsar** Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256. See p. 243.

Camponotus cæsar Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 162 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 503, fig. (☿, ♀); 1909, ibid., LIII, p. 66 (☿). Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 28, p. 2 (☿).

Type locality: Angola (M. Buchner).

Benguela: (C. Wellman). Belgian Congo: Faradje (Lang and Chapin); Luapula River.

15*a*. Subsp. **imperator** Emery, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 503, fig. (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 391 (☿). See p. 244.

Type locality: Cameroon (Conradt).

Cameroon: Lomie (Thesing); Mundame (Conradt). Belgian Congo: Kasongo Forest (Grauer); Isangi (Lang and Chapin).

16. **Camponotus (Dinomyrmex) caffer** Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus caffer Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 47 (☿), Pl. ii, figs. 25, 26; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1904, Ann. Soc. Ent. Belgique, XLVIII, p. 177.

Camponotus maculatus subsp. *caffer* Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 69 (☿, ♀).

Camponotus (Myrmoturba) caffer Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Type locality: Makapan, Transvaal (E. Simon).

Cape Province: Port Elizabeth (H. Brauns); Cape of Good Hope.

17. **Camponotus (Dinomyrmex) immigrans** Santschi, 1921, Ann. Soc. Ent. Belgique, LXI, p. 312 (☿).

Camponotus (Myrmothrix) immigrans Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 436 (☿, ♀, ♂).

Camponotus (? Myrmothrix) immigrans Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Type locality: Molundu, Cameroon (Reichensperger).

18. **Camponotus (Dinomyrmex) langi** Wm. M. Wheeler. See p. 241. (☿, ♀, ♂).

Type locality: Faradje, Belgian Congo (Lang and Chapin).

Belgian Congo: Garamba (Lang and Chapin).

19. **Camponotus (Dinomyrmex) longipes** (Gerstæcker) Forel, 1913, Rev. Zool. Afr., II, p. 340 (☿); 1914, Rev. Suisse Zool., XXII, p. 268; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 249 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 132 (☿, ♀ ?). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Formica longipes Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 509 (☿), Pl. xxxii, fig. 7.

Camponotus longipes Roger, 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 400. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 354; 1873, in 'v. d. Decken's Reisen in Ost-Afrika, Gliederthiere,' p. 343 (☿). Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 164 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 240. Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 113 (♂). Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿, ♂); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16 (♀); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 266 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 391 (☿).

Type locality: Mozambique, Portuguese East Africa (Peters).

Belgian Congo: Sankisia (J. Bequaert); Boga, west of Mt. Ruwenzori (Schubotz). Southern Rhodesia: Mondu River (Zeally). Portuguese East Africa: Inhambane (Fornasini). Nyasaland: Shore of Lake Nyasa (Heyne). German East Africa: Himo River, Mt. Kilimanjaro (C. Alluaud); Barikiwa (Schröder); Mafia Island (Voeltzkow); Daressalaam (A. Müller). Zanzibar: (Hildebrandt). British East Africa: Ndara (v. d. Decken); Moschi to the Uganda Railroad (Zimmer); Nairobi, Kikuyu, 1700 m.; Taveta, 750 m.; Voi, Taita; Mt. Kenia, Meranga District, Fort Hall; Cheteni (Alluaud and Jeannel); Chake-Chake, Pemba Island; Fundu, W. Pemba (Voeltzkow). UGANDA: Buzubizi (C. Alluaud). WESTERN ABYSSINIA: (Ilg).

20. **Camponotus** (**Dinomyrmex**) **massinissa** WM. M. WHEELER. See p. 244 (♀).

Type locality: Medje, BELGIAN CONGO (Lang and Chapin).

21. **Camponotus** (**Dinomyrmex**) **pompeius** FOREL. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus rubripes subsp. *pompeius* FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 157 (☿).

Camponotus pompeius DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 248. EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 501, fig. (☿, ♀). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀).

Camponotus maculatus subsp. *pompeius* EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769.

Camponotus (*Myrmogigas*) *pompeius* SANTSCHI, 1914, Deutsch. Ent. Zeitschr., p. 288 (☿).

Camponotus (*Myrmoturba*) *pompeius* FOREL, 1914, Rev. Suisse Zool., XXII, p. 267. STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 403 (☿).

Type locality: Gaboon, FRENCH CONGO (Büttner).

TOGO: Bismarckburg (Conradt). CAMEROON: Duala (v. Rothkirch); Campo Mountains (Schultze); Mundame (Conradt). FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Libenge; Duma (Schubotz).

21*a*. Subsp. **cassius** WM. M. WHEELER. See p. 239 (☿).

Type locality: Yakuluku, BELGIAN CONGO (Lang and Chapin).

BELGIAN CONGO: Medje (Lang and Chapin).

21*b*. Subsp. **marius** EMERY, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 502, fig. (☿). STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 403 (☿, ♀). See p. 239.

Camponotus maculatus subsp. *cognatus* MAYR, 1896, Ent. Tidskr., XVII, p. 249 (*nec* F. Smith).

Type locality: CAMEROON (Conradt; Sjöstedt).

CAMEROON: Molundu; Yukaduma (Schultze). FRENCH CONGO: Gaboon. BELGIAN CONGO: Duma (Schubotz); Kimuenza (Schultze); Medje; Akenge; Niapu (Lang and Chapin).

22. **Camponotus** (**Dinomyrmex**) **sexpunctatus** FOREL, 1914, Rev. Suisse Zool., XXII, p. 268. SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 133 (☿, ♀). EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus sexpunctatus FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 66 (☿, ♀).

Camponotus maculatus subsp. *sexpunctatus* EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769. ALLUAUD and JEANNEL, 1914, Arch. Zool. Gén. Exp., LIII, p. 375.

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (P. Berthoud).

BRITISH EAST AFRICA: Kibwezi, Wa-Kamba (C. Alluaud). ZANZIBAR: Haitajwa Cave (Alluaud and Jeannel).

23. **Camponotus (Dinomyrmex) varus** Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus varus Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 455 (☿).

Type locality: Mossamedes (Baum and Van der Kellen).

24. **Camponotus (Dinomyrmex) wellmani** Forel, 1913, Rev. Zool. Afr., II, p. 340 (☿); 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus wellmani Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 67 (☿, ♀); 1911, Rev. Zool. Afr., I, p. 281 (☿). Santschi, ibid., p. 211 (☿). Forel, 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 180 (☿).

Camponotus (Dinomyrmex) wellmanni Forel, 1916, Rev. Suisse Zool., XXIV, p. 441 (☿).

Type locality: Benguela (C. Wellman).

Benguela: Cucala (J. Cruchet). Belgian Congo: Beni (Murtula); Kapema; Kipaila (S. Neave); Bamayanga. German East Africa: Kifumbiro to Karagwe, between the great lakes.

24_1. Var. **rufipartis** Forel, 1916, Rev. Suisse Zool., XXIV, p. 441 (☿, ♀, ♂). See p. 245.

Type locality: Belgian Congo (Kohl).

Belgian Congo: Stanleyville; Faradje; Ngayu; Niangara (Lang and Chapin).

Subgenus 3. **Myrmosericus** Forel

Camponotus subg. *Myrmosericus* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 91; 1914, Rev. Suisse Zool., XXII, p. 259. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 236.

Subgenotype: *Formica rufoglauca* Jerdon, 1851.

25. **Camponotus (Myrmosericus) angusticeps** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus angusticeps Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 355 (☿), Pl. xvii, fig. 1. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 221. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

Type locality: Cape of Good Hope (L. Péringuey).

26. **Camponotus (Myrmosericus) druryi** Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus druryi Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 160 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 769. H. Stadelmann, 1898, Deutsch-Ost-Afrika,' IV, Hym., p. 37.

Type locality: Zanzibar (Hildebrandt).

27. **Camponotus (Myrmosericus) eugeniæ** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 146 (☿); 1914, Rev. Suisse Zool., XXII, p. 268. Santschi, 1914, Med. Goteborgs Mus. Zool. Afd., III, p. 41 (☿). Trägårdh, ibid., p. 46. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus micans subsp. *eugeniæ* Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 78 (☿).

Camponotus eugeniæ Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 174 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 230. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 50; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

Camponotus rufoglaucus var. *eugeniæ* Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 36.

Type locality: Valdezia, Transvaal (P. Berthoud).

Southern Rhodesia: Springvale (G. Arnold). Transvaal: Makapan (E. Simon). Cape Province: Kimberley (E. Simon). Basutoland: Lessouto (P. Berthoud). Zululand: Junction of the Umfolosi Rivers (I. Tragårdh). German East Africa: Kihengo (Stuhlmann).

27a. Subsp. **amplior** Forel, 1913, Rev. Zool. Afr., II, p. 341 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Belgian Congo: Old Kasongo (J. Bequaert).

28. **Camponotus (Myrmosericus) petersi** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 268; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus petersii Emery, *in litt.*, Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70 (without description). Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 50 (☿), Pl. II, fig. 28; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30 ((☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 451.

Type locality: Vrijburg, Cape Province (E. Simon).

Rhodesia: Bulawayo (G. Arnold). Transvaal: Pretoria (E. Simon); Lydenburg (Wilms). Natal: (Haviland). Portuguese East Africa: Delagoa (Liengme).

28_1 Var. **janus** Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 288 (☿).

Type locality: Bothaville, Orange Free State (H. Brauns).

29. **Camponotus (Myrmosericus) rufoglaucus** (Jerdon) Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 91; 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Formica rufoglauca Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 124; 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 107 (☿).

Camponotus rufoglaucus Emery, 1895, Ann. Soc. Ent. France, LXIV, pp. 48, footnote and 50, footnote, fig. (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

Type locality: Carnatic, India (Jerdon).

29a. Subsp. **cinctellus** (Gerstæcker) Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿); 1901, Mitth. Schweiz. Ent. Ges., X, p. 311; in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 564; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89; 1909, Ann. Soc. Ent. Belgique, LIII, p. 67 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 12 (☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 356 (☿). Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿, ♀); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 133 (☿); 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41. Trägårdh, ibid., p. 46. See p. 246.

Formica cinctella Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿, ♀, ♂); in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 510 (☿, ♀, ♂). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 413.

Camponotus cinctellus Roger, 1863, 'Verzeich. Formicid.,' p. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 224.

Camponotus venustus Frauenfeld, 1867, Verh. Zool. Bot. Ges. Wien, XVII, p. 441 (☿). Mayr, 1878, ibid., XXVIII, p. 662, footnote (☿).

Camponotus rufoglaucus var. *cinctellus* Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 48, footnote (☿); 1895, Ann. Mus. Civ. Genova, XXXV, p. 180; 1896, ibid., XXXVII, p. 158 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 36.

Type locality: Mozambique, Portuguese East Africa (Peters).

Belgian Congo: Zambi (J. Bequaert); Congo da Lemba; Mondombe; Mandungu; Eala (R. Mayné); Leopoldville (J. Maes). Benguela: (C. Wellman). Mossamedes: between the Cubango and Cuito Rivers (Baum and Van der Kellen). Transvaal: Pretoria (F. Silvestri). Natal: (v. Schuckardt); Stamford Hill (I. Tragårdh). Portuguese East Africa: Delagoa (Liengme); Tete (Peters); Lobombo Borges (Wilms). East Africa: common (Voeltzkow). German East Africa: Sachsenwald near Daressalaam (H. Prell); Uluguru Mts.; Amani (Zimmer); Tanga (Zimmer; C. Alluaud). Zanzibar: (Stuhlmann; Voeltzkow); Mwera River (C. Alluaud). British East Africa: Gazi; Likoni; Tiwi; Mombasa; Buru, Wa-Taita; Fort Hall, Kikuyu, 1330 m. (Alluaud and Jeannel). Somaliland: Matagoi to Lugh (V. Bottego). Abyssinia: Boran Galla, Middle Ganale (V. Bottego). Anglo-Egyptian Sudan: Khartum (Karawaiew).

$29a_1$. Var **intuens** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 67 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 271 (☿); 1913, Rev. Zool. Afr., II, p. 340 (☿).

Type locality: Benguela (C. Wellman).

Belgian Congo: Kwesi to Kilo (Bayer). Eritrea: Nefasit (K. Escherich).

$29a_2$. Var. **rufigenis** Forel, 1913, Rev. Zool. Afr., II, p. 341 (☿). Bequaert, ibid., p. 430. See p. 246.

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Belgian Congo: Stanleyville; Medje; Poko; Akenge; Niangara; Garamba; Faradje (Lang and Chapin).

$29a_3$. Var. **ustithorax** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 271 (☿); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) LXVII, p. 371 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 392 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 356 (☿); 1913, Rev. Zool. Afr., II, p. 340 (☿); 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 350 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 133 (☿).

Type locality: Ghinda, Eritrea (K. Escherich).

Belgian Congo: Beni (Borgerhoff); St. Gabriel (Kohl); Yambata; Mandungu; Mondombe (R. Mayné); Karemi (Bayer); Kwidjwi Island, Lake Kivu (Schubotz). German East Africa: Buiko; Monga (H. Prell); Amani; Ulenge (Zimmer). British East Africa: Kavirondo Bay, Victoria Nyanza, 1112 m. (Alluaud and Jeannel). Uganda: Western Unyoro, between Hoima and Butiaba; Ibanda, Mt. Ruwenzori, 1400 m. (C. Alluaud); Chacansengula to Kasengui (Bayer).

29b. Subsp. **controversus** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 509.

Camponotus rufoglaucus subsp. *flavopilosus* Viehmeyer, 1914, Arch. f. Naturg., LXXIX, Abt. A, Heft 12, (1913), p. 47 (☿) (*nec C. fulvopilosus* var. *flavopilosus* Emery, 1895).

Type locality: Manow, Langenburg, German East Africa.

Belgian Congo: Lungube, Katanga (Gérard).

29*c*. Subsp. **cosmicus** (F. Smith) Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 49; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p 20. Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 401 (☿).

Formica cosmica F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 34 (☿). Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 413.

Camponotus cosmicus Roger, 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 355. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 227. G. K. Marshall, 1902, Trans. Ent. Soc. London, pp. 535 and 569 (☿), Pl. xix, figs. 55 and 56. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 63 (☿). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 331 and 375.

Type locality: Port Natal, Natal (R. W. Plant).

Transvaal: Waterval Onder (Ross); Pretoria; Hamman's Kraal (E. Simon). Cape Province: Hebron; De Aar (E. Simon); East London (Dixey and Longstaff). Natal: Estcourt (Dixey and Longstaff). German East Africa: Ngare na Nyuki, Meru (Sjöstedt). Belgian Congo: Duma (Schubotz). Rhodesia: Salisbury (Marshall).

29*d*. Subsp. **flavomarginatus** (Mayr) Emery, 1895, Ann. Soc. Ent. France, LXIV, pp. 48, footnote (☿) and 50, footnote, fig.; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604; 1899, ibid., XXXIX, p. 501. Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 144 (☿, ♀, ♂). Reichensperger, 1913, Zool. Jahrb. Abt. Syst., XXXV, p. 215. See p. 247.

Camponotus flavomarginatus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 664 (☿); 1863, ibid., XIII, p. 399. Roger, 1863, 'Verzeich. Formicid.,' p. 2. Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 365 (☿).

Camponotus micans var. *flavomarginatus* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 174 (☿, ♀).

Camponotus micans subsp. *albisectus* Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 120 (☿).

Camponotus albisectus Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 221.

Camponotus rufoglaucus subsp. *cinctellus* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70.

Camponotus rufoglaucus subsp. *cinctellus* var. *flavomarginatus* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 271 (☿).

Camponotus (*Myrmosericus*) *albisectus* Forel, 1914, Rev. Suisse Zool., XXII, p. 268.

Camponotus (*Myrmosericus*) *rufoglaucus* subsp. *cinctellus* var. *flavomarginatus* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿). Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿).

Type locality: Akwapim Mountains, Gold Coast.

Abyssinia: Harar; Tchercher; confluent Akaki; Karssa; Mt. Zyoual; Kounhi; Barko; Bourka (de Rothschild); Bass Narok (V. Bottego); western Abyssinia (Ilg). Eritrea: Keren (Beccari). Somaliland: Ganale (Ruspoli); Mogadiscio (Bricchetti-Robecchi). Natal: Stamford Hill (I. Trägårdh); Durban (C. B. Cooper). Portuguese East Africa: Delagoa Bay (Liengme). Transvaal:

Valdezia (P. Berthoud). ANGOLA: (M. Buchner). BELGIAN CONGO: Thysville (J. Bequaert); Akenge; Vankerckhovenville; Garamba; Faradje (Lang and Chapin).

$29d_1$. Var. **contrarius** SANTSCHI, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 509 (☿).

Type locality: Victoria Falls, RHODESIA (G. Arnold).

$29d_2$. Var. **paucipubens** SANTSCHI, 1911, Rev. Zool. Afr., I, p. 212 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿).

Camponotus rufoglaucus subsp. *cinctellus* var. *paucipubens* FOREL, 1913, Rev. Zool. Afr., II, p. 341 (☿). BEQUAERT, ibid., p. 430. STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 401 (☿).

Type locality: Cucala, BENGUELA (J. Cruchet).

ANGOLA: Quifangondo (F. Silvestri). BELGIAN CONGO: Welgelegen (J. Bequaert). FRENCH CONGO: Fort Crampel (Schubotz).

29*e*. Subsp. **syphax** WM. M. WHEELER. See p. 246 (☿).

Type locality: Zambi, BELGIAN CONGO (Lang, Chapin, and J. Bequaert).

BELGIAN CONGO: Boma (Lang, Chapin, and J. Bequaert).

29*f*. Subsp. **vestitus** (F. SMITH) EMERY, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 113 (♀). FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. EMERY, 1895, Ann. Soc. Ent. France, LXIV, pp. 48, 49, footnote (☿), and 50, footnote, fig.; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. FOREL, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16 (♀). SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿).

Formica vestita F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32 (♀). MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 422.

Camponotus rufoglaucus subsp. *cinctellus* var. *vestita* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89; in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿, ♀); 1910, Ann. Soc. Ent. Belgique, LIV, p. 457 (☿, ♀); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 272 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 355 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿).

Type locality: Port Natal, NATAL.

CAPE PROVINCE: Cape Town (E. Simon; Bergius; Wilms); Mafeking (G. Arnold). TRANSVAAL: Pretoria (F. Silvestri); Lydenburg (Wilms). NATAL: (Haviland). ZULULAND. Junction of the Umfolosi Rivers (I. Trägårdh). PORTUGUESE EAST AFRICA: Delagoa (Liengme); Mozambique (Fornasini). GERMAN SOUTHWEST AFRICA: (Lübbert); Okahandja (Peters; Casper); Grootfontein (v. Erffer). BELGIAN CONGO: Elisabethville (Leplae); Karemi (Bayer); valley of the Lubumbashi (Buttgenbach). WESTERN ABYSSINIA: (Ilg). East Africa: (Voeltzkow).

$29f_1$. Var. **pectitus** SANTSCHI, 1911, Rev. Zool. Afr., I, p. 212 (☿, ♀).

Camponotus (*Myrmosericus*) *rufoglaucus* subsp. *cinctellus* var. *pectita* FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 224 (☿).

Type locality: Cucala, BENGUELA (J. Cruchet).

FRENCH CONGO: Moyen Chari (Decorse). SOUTHERN RHODESIA: Bembesi (G. Arnold).

20*g*. Subsp. **zanzibaricus** FOREL, 1911, Sitzb. Bayer. Akad. Wiss., p. 287 (☿).

Type locality: ZANZIBAR.

29*h*. Subsp. **zimmermanni** (FOREL) EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 49, footnote; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770; 1896, Ann. Mus. Civ. Genova, XXXVII, p. 158 (☿); 1897, ibid., XXXVIII, p. 604 (☿).

Camponotus zimmermanni Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 66 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 381 (☿).

Camponotus (*Myrmosericus*) *zimmermanni* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Type locality: Southern Abyssinia (Ilg).

British East Africa: Maddo Wells (V. Bottego). Somaliland: Salmoreto (Ruspoli). Abyssinia: Harar (Dmitriev); Webi (Ruspoli).

29*i*. Subsp. **zulu** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 49, footnote, and p. 50 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770; 1895, Ann. Mus. Civ. Genova, XXXV, p. 180. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿).

Type locality: Isipingo, Natal (Weitzecker).

Natal: Verulam (Weitzecker); Amanzimtoti (Trägårdh). Abyssinia: Arussi Galla, Ganale Gudda (V. Bottego).

30. **Camponotus** (**Myrmosericus**) **valdeziæ** Forel, 1914, Rev. Suisse Zool., XXII, p. 268.

Camponotus valdeziæ Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 90 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 256. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 20.

Type locality: Valdezia, Transvaal (P. Berthoud).

German East Africa: Kilimanjaro (Sjöstedt).

Subgenus 4. **Orthonotomyrmex** Ashmead

Orthonotomyrmex Ashmead, 1906, Proc. Ent. Soc. Washington, VIII, p. 31.

Orthonotus Ashmead, 1905, Canadian Ent., XXXVII, p. 384 (*nec* Westwood, 1829).

Camponotus subg. *Myrmentoma* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 92.

Camponotus subg. *Orthonotomyrmex* Forel, 1914, Rev. Suisse Zool., XXII, p. 264. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 244.

Subgenotype: *Formica sericea* Fabricius, 1798 (Ashmead, 1905); *Formica lateralis* Olivier, 1791 (Forel, 1914).

31. **Camponotus** (**Orthonotomyrmex**) **acutisquamis** Mayr. Forel, 1914, Rev. Suisse Zool., XXII, p. 273. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus acutisquamis Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 296 (☿).

Camponotus chrysurus subsp. *acutisquamis* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 269; 1913, Rev. Suisse Zool., XXI, p. 670 (☿, ♀).

Camponotus (*Orthonotomyrmex*) *chrysurus* subsp. *acutisquamis* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 256 (☿); 1916, Rev. Suisse Zool., XXIV, p. 444 (♀, ♂).

Type locality: Bonjongo, Cameroon (R. Buchholz).

Cameroon: (Conradt). Belgian Congo: (Kohl); Mayombe (de Briey).

32. **Camponotus** (**Orthonotomyrmex**) **arminius** (Forel) Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus barbarossa subsp. *arminius* FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 457 (☿).[1]

Type locality: Delagoa, PORTUGUESE EAST AFRICA (Liengme).

32₁. **Var. bicontractus** (FOREL).

Camponotus barbarossa subsp. *arminius* var. *bicontractus* FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 256 (☿).

Type locality: Durban, NATAL (G. Arnold).

33. **Camponotus (Orthonotomyrmex) braunsi** MAYR. FOREL, 1914, Rev. Suisse Zool., XXII, p. 273; 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 135 (♀). EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.[2]

Camponotus braunsi MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 151 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. MAYR, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 28, footnote (☿, ♀).

Camponotus (Myrmentoma) braunsi FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 146 (☿).

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (H. Brauns).

RHODESIA: (G. Arnold). BELGIAN CONGO: Congo da Lemba (R. Mayné). GERMAN EAST AFRICA: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel); Waboniland.

33a. Subsp. **erythromelus** EMERY, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 605; 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227; 1899, Ann. Mus. Civ. Genova, XXXIX, p. 501 (☿).

Camponotus erythromelus EMERY, 1896, ibid., XXXVII, p. 158, fig. (☿).

Type locality: Lugh, SOMALILAND (V. Bottego).

SOMALILAND: Matagoi to Lugh (V. Bottego); Magala Re Umberto (Ruspoli). ABYSSINIA: Ganale River; Ogaden (Ruspoli); Sancurar to Amarr Burgi (V. Bottego).

33a₁. Var. **transitorius** SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 135 (☿).

Type locality: River Amboni, Mt. Kenia, BRITISH EAST AFRICA (C. Alluaud).

34. **Camponotus (Orthonotomyrmex) chrysurus** GERSTÆCKER. FOREL, 1913, Rev. Zool. Afr., II, p. 346 (♀); 1914, Rev. Suisse Zool., XXII, p. 273; 1914, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿, ♀); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 350 (☿, ♀). SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 135 (☿, ♀). EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.[3]

Camponotus chrysurus GERSTÆCKER, 1871, Arch. f. Naturg., XXXVII, 1, p. 355 (☿); 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 345 (☿), Pl. XIV, fig. 9. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 224. EMERY, 1895, Ann. Mus. Civ. Genova, XXXV, p. 183 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37. FOREL, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 308 (☿); 1909, ibid., LIII, p. 67 (☿). BEQUAERT, 1913, Rev. Zool. Afr., II, p. 431.

Type locality: Ndara, BRITISH EAST AFRICA (v. d. Decken).

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[1] *Camponotus barbarossa* 'Emery, *in litt.*' Forel, 1914, Rev. Suisse Zool., XXII, p. 273, has never been described. Santschi (1921) makes *C. arminius* the type of his subgenus *Myrmopelta*.

[2] Placed by Santschi (1921) in his subgenus *Myrmisolepis*.

[3] Placed by Santschi (1921) in his subgenus *Myrmopelta*.

Belgian Congo: Elisabethville; Sankisia (J. Bequaert); St. Gabriel (Kohl); Congo da Lemba; Mondembe (R. Mayné); Mayombe (de Briey). Benguela: (C. Wellman). German East Africa: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). Abyssinia: Arussi Galla, Ganale Gudda (V. Bottego). British East Africa: Nairobi, Kikuyu, 1700 m. (Alluaud and Jeannel); Tsavo (Bayer).

34_1. Var. **apellis** (Forel) Santschi, 1911, Rev. Zool. Afr., I, p. 213.

Camponotus chrysurus subsp. *acutisquamis* var. *apellis* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 269 (☿); 1911, Rev. Zool. Afr., I, p. 281 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 397 (☿).

Type locality: Benguela (C. Wellman).

Benguela: Cucala (J. Cruchet). Belgian Congo: Banana (Etienne); Duma (Schubotz).

34a. Subsp. **kohlbrunneri** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 268 (☿).

Type locality: Western Abyssinia (Ilg).

35. **Camponotus (Orthonotomyrmex) dofleini** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus dofleini Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 291 (☿).

Camponotus (Myrmosphincta) dofleini Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Bothaville, Orange Free State (H. Brauns).

36. **Camponotus (Orthonotomyrmex) epinotalis** Santschi, 1916, Ann. Soc. Ent. France, LXXXIV, (1915), p. 508 (☿). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.[1]

Type locality: Victoria Falls, Rhodesia (G. Arnold).

37. **Camponotus (Orthonotomyrmex) erinaceus** Gerstæcker. Forel, 1914, Rev. Suisse Zool., XXII, p. 273. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 135 (☿). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.[2]

Camponotus erinaceus Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 355 (☿); 1873, in 'v. d. Decken's Reisen in Ostafrika, Gliederthiere,' p. 345 (☿), Pl. xiv, fig. 10. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 183 (♀); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38. Forel, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 306 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 31 (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 21 (☿, ♀). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 371 (☿).

Type locality: Arusha, German East Africa (v. d. Decken).

German East Africa: Kilimanjaro (Bornemisza); Kibosho, Mt. Kilimanjaro (C. Alluaud); Kibonoto, Kilimanjaro, 1300–1900 m. (Sjöstedt); Moschi (H. Prell). British East Africa: Monga (H. Prell); Nairobi, 1700 m. (Alluaud and Jeannel). Abyssinia: Arussi Galla, Ganale Gudda (V. Bottego).

38. **Camponotus (Orthonotomyrmex) mayri** Forel, 1914, Rev. Suisse Zool., XXII, p. 273. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus mayri Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 92 (☿), Pl. i, fig. 1; 1886, Ann. Soc. Ent. Belgique, XXX, ρ. 191 (☿). Dalla Torre,

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[1] Santschi (1921) makes this the type of his subgenus *Myrmisolepis*.

[2] Placed by Santschi (1921) in his subgenus *Myrmisolepis*.

1893, 'Cat. Hym.,' VII, p. 242. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 55 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 21. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 451 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. (1907–08),' III, p. 392 (☿).

Camponotus (Myrmentoma) mayri Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 146 (☿).

Type locality: Valdezia, Transvaal (P. Berthoud).

French Congo: Brazzaville (A. Weiss). Portuguese Congo: Chinchoxo. Belgian Congo: Kasindi (Schubotz). Southern Rhodesia: Springvale (G. Arnold). Transvaal: Makapan; Pretoria; Hamman's Kraal (E. Simon). Natal: Durban. Portuguese East Africa: Delagoa (Liengme). German East Africa: Kibonoto, Kilimanjaro (Sjöstedt). Zanzibar: (Hildebrandt). British East Africa: Chake-Chake, Pemba Island (Voeltzkow); Mombasa (Hildebrandt).

38_1. Var. **cubangensis** Forel, 1895, Mitth. Schweiz. Ent. Ges., X, p. 309 (☿, ♀).

Camponotus mayri var. *kubangensis* Forel, in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 563 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

38*a*. Subsp. **ledieui** Forel, 1916, Rev. Suisse Zool., XXIV, p. 444 (☿).

Type locality: Shilouvane, Transvaal (Junod).

38*b*. Subsp. **sankisianus** Forel, 1913, Rev. Zool. Afr., II, p. 347 (☿). Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 313.

Type locality: Sankisia, Belgian Congo (J. Bequaert).

French Congo: Mandouga (A. Weiss).

39. **Camponotus (Orthonotomyrmex) scalaris** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.[1]

Camponotus scalaris Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 308 (☿).

Camponotus (Myrmosphincta) scalaris Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Natal, 1800 m. (Haviland).

40. **Camponotus (Orthonotomyrmex) sericeus** (Fabricius) Forel, 1914, Rev. Suisse Zool., XXII, p. 273. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 134 (☿, ♀); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿). Emery, 1915, ibid., X, p. 4 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 397 (☿, ♂). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258. See pp. 249 and 1050.

Formica sericea Fabricius, 1798, 'Suppl. Ent. Syst.,' p. 279 (☿). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 117 (☿), Pl. iii, fig. 17. Coquebert, 1804, 'Illustr. Iconogr. Ins.,' III, p. 99 (☿), Pl. xxii, fig. 12. Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 217 (☿). F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 31.

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[1] Placed by Santschi (1921) in his subgenus *Myrmisolepis*

Formica aurulenta Latreille, 1802, 'Hist. Nat. Fourmis,' p. 114 (♀), Pl. iii, fig. 9. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 31. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 412.

Lasius sericeus Fabricius, 1804, 'Syst. Piez.,' p. 416 (☿).

Formica cinerascens Jerdon, 1851, Madras Journ. Litt. Sc., XVIII, p. 123 (☿, ♂) (*nec* Fabricius); 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 106 (☿, ♂).

Formica obtusa F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 30 (☿).

Camponotus sericeus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 675 (☿), Pl. xix, fig. 4; 1863, ibid., XIII, p. 401. Roger, 1863, 'Verzeich. Formicid.,' pp. 2 and 44 (☿). Mayr, 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 886 (♀). Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 364 (☿, ♀). Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 94 (☿, ♀). Emery, 1881, Ann. Mus. Civ. Genova, XVI, p. 526. Ern. André, 1882, 'Spec. Hym. Europ. Algérie,' II, p. 149 (☿). Magretti, 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿); 1884, Ann. Mus. Civ. Genova, XXI, p. 537 (☿, ♀). Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 192 (☿, ♀, ♂); 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 19 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 120; 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 251. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 184; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 605; 1899, ibid., XXXIX, p. 501. G. K. Marshall, 1902, Trans. Ent. Soc. London, pp. 535 and 569 (☿), Pl. xix, fig. 54. Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 11. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 63 (☿). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 21; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 389. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿). F. F. Kohl, 1907, Denkschr. Ak. Wiss. Wien, LXXI, p. 283 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 268 (☿). Longstaff, 1911, Ent. Monthly Mag., XLVII, p. 124 (☿). Karawaiew, 1911, Rev. Russe Ent., XI, p. 11 (☿). Lamborn, 1914, Trans. Ent. Soc. London, (1913), Proc., p. cxxiv.

Camponotus (*Myrmentoma*) *sericeus* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 146 (☿).

Type locality: Senegal (Bosc).

India, Ceylon, Arabia, Egypt. Senegambia: Dakar (C. Alluaud; F. Silvestri); Cape Verde. Togo: Misahöhe (Smend). Southern Nigeria: Moor Plantation near Ibadan (Lamborn). French Congo: Brazzaville (A. Weiss). Belgian Congo: Medje; Poko; Faradje (Lang and Chapin); Duma (Schubotz); Kabare (J. Bequaert). Anglo-Egyptian Sudan: Khartum (I. Trägårdh; Karawaiew); Kerreri (Longstaff); Suakin; Kor Langhebb; Kassala (Magretti). Eritrea: Keren; between Massaua and Ain (Beccari); Asmara; Ghinda (F. Silvestri); Assab (Doria and Beccari); Kor Lebka (Magretti). Southern Arabia: Makalla (O. Simony). Abyssinia: (Ilg); Arussi Galla, Ganale Gudda, Dimé to Bass Narok; Bass Narok (V. Bottego); Coromma; Ettoke; Bela (Ruspoli). Somaliland: (C. Keller); Obbia (Bricchetti-Robecchi). Uganda: Gondokoro (F. Werner); Western Unyoro, between Hoima and Butiaba (C. Alluaud). East Africa: common (Voeltzkow). British East Africa: Mt. Kenia, Meranga District, Fort Hall; Kisumu, Victoria Nyanza; Tchania River, 1520 m.; Likoni (Alluaud and Jeannel).

GERMAN EAST AFRICA: Kibonoto, Mt. Kilimanjaro, 1000–1200 m. (Sjostedt); Himo River, Mt. Kilimanjaro (C. Alluaud). SOUTHERN RHODESIA: Salisbury (Marshall); Khami River (G. Arnold).

40_1. Var. **sulgeri** SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 313 (☿).

Camponotus (*Orthonotomyrmex*) *sericeus* subsp. *sulgeri* STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 397 (☿, ♀).

Type locality: Brazzaville, FRENCH CONGO (A. Weiss).

BELGIAN CONGO: Duma (Schubotz).

41. **Camponotus** (**Orthonotomyrmex**) **vividus** (F. SMITH) SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 264. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258. See p. 247.[1]

Formica vivida F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 31 (☿). MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 422.

Formica laboriosa F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32 (♀). MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 416.

Camponotus vividus ROGER, 1863, 'Verzeich. Formicid.,' p. 2. MAYR, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 354. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 257. EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227.

Camponotus laboriosus ROGER, 1863, 'Verzeich. Formicid.,' p. 2. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 237. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Colobopsis vivida MAYR, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 354.

Camponotus meinerti FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 189 (☿, ♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 242. FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. ERN. ANDRÉ, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿, ♀). MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 151. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. FOREL, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 74; 1907, ibid., XXIV, p. 16 (♀). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀). STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀). FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 451 (☿); 1911, Rev. Zool. Afr., I, p. 282 (☿).

Camponotus (*Colobopsis*) *vividus* EMERY, 1889, Ann. Mus. Civ. Genova, XXVII, p. 517.

Camponotus (*Orthonotomyrmex*) *meinerti* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿). FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿); 1913, Rev. Zool. Afr., II, p. 346 (☿, ♂); 1914, Rev. Suisse Zool., XXII, p. 273; 1916, ibid., XXIV, p. 444 (☿, ♀). STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 396 (☿, ♀).

Type locality: SIERRA LEONE (D. F. Morgan).

SENEGAMBIA: Dakar (F. Silvestri). FRENCH GUINEA: Los Islands (H. Brauns); Konakry (F. Silvestri). SIERRA LEONE: (H. Brauns); Samlia Falls, River N'Gamie (Mocquerys). LIBERIA: (Kieselbach); Monrovia (Duke). GOLD COAST: Akra; Addah. TOGO: Bismarckburg (Conradt). SOUTHERN NIGERIA: Olokemeji (F. Silvestri). CAMEROON: Mundame (Conradt); Bibundi (Tessmann). FERNANDO Po: (Conradt). SPANISH GUINEA: Alen (Tessmann). FRENCH CONGO: Loango (H. Brauns); Gaboon (Buttner); Ogowe (Mocquerys); Brazzaville; Mandouga (A.

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[1] Placed by Santschi (1921) in his subgenus *Myrmopelta*.

Weiss); Fort Archambault; Fort de Possel to Fort Crampel; Mongumba (Schubotz). Belgian Congo: Boma (H. Brauns); Kondué (Luja); Leopoldville (Dubois); Eala (R. Mayné); Mayombe (de Briey); Duma (Schubotz); Lukolela; Malela (Lang and Chapin). Angola: Malange (M. Buchner). Portuguese East Africa: Delagoa (Liengme); Ibo.

41$_1$. Var. **semidepilis** Wm. M. Wheeler. See p. 248 (☿).

Type locality: Medje, Belgian Congo (Lang and Chapin).

Belgian Congo: Leopoldville (Lang and Chapin).

41a. Subsp. **cato** (Forel). See p. 248.

Camponotus (*Orthonotomyrmex*) *meinerti* subsp. *cato* Forel, 1913, Rev. Zool. Afr., II, p. 346 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Belgian Congo: Stanleyville; Garamba; Medje; Avakubi; Akenge; Bengamisa; Niangara; Thysville (Lang and Chapin).

41b. Subsp. **reginæ** (Forel).

Camponotus reginæ Forel, 1901, Mitth. Schweiz. Ent. Ges., X, p. 307 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 562 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 66 (☿).

Camponotus meinerti var. *reginæ* Forel, 1911, Rev. Zool. Afr., I, p. 282 (☿); 1911, Sitzb. Bayer. Akad. Wiss., p. 291 (☿).

Camponotus (*Orthonotomyrmex*) *meinerti* subsp. *reginæ* Forel, 1913, Rev. Suisse Zool., XXI, p. 670 (☿); 1913, Rev. Zool. Afr., II, p. 346 (☿).

Camponotus meinerti subsp. *reginæ* Bequaert, ibid., p. 431.

Camponotus (*Myrmentoma*) *meinerti* subsp. *reginæ* Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 146 (☿).

Type locality: between the Cubango and Cuito Rivers, Mossamedes (Baum and Van der Kellen).

Liberia. Cameroon: (Conradt); Victoria (Fickendey). Belgian Congo: Shinsenda (J. Bequaert); Kondué (Luja). Benguela: (C. Wellman). Southern Rhodesia: Kandahar Island, Zambesi River (G. Arnold).

Subgenus 5. **Myrmotrema** Forel

Camponotus subg. *Myrmotrema* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 91; 1914, Rev. Suisse Zool., XXII, p. 262. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 245.

Subgenotype: *Camponotus foraminosus* Forel, 1879.

42. **Camponotus** (**Myrmotrema**) **aurofasciatus** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 267 and 276 (☿); 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' p. 4 (☿).

Type locality: San Thomé.

43. **Camponotus** (**Myrmotrema**) **bayeri** Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258. See p. 252.

Camponotus bayeri Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 356 (☿).

Type locality: Karemi, Belgian Congo (Bayer).

Belgian Congo: Faradje (Lang and Chapin).

44. **Camponotus** (**Myrmotrema**) **bituberculatus** Ern. André. Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar.

Portici, VIII, p. 381 (☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 271. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus bituberculatus Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 271 (☿); 1890, ibid., IX, p. 311 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Type locality: Dakar, Senegambia (Mocquerys).

Sierra Leone: (Mocquerys). French Guinea: Kakoulima (F. Silvestri).

45. **Camponotus (Myrmotrema) bottegoi** Emery. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 136 (☿, ♀); 1915, Ann. Soc. Ent. France, LXXXIV, p. 270. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus bottegoi Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 181 (☿, ♀); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus (Myrmoturba) bottegoi Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Type locality: Lower Ganana, Somaliland (V. Bottego).

Abyssinia: Boran Galla, Middle Ganale (V. Bottego). Somaliland: Obbia (Bricchetti-Robecchi). British East Africa: Taveta; Voi (Alluaud and Jeannel). German East Africa: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). Zanzibar: Mwera River (C. Alluaud).

46. **Camponotus (Myrmotrema) carbo** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus carbo Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 364, fig. (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775; 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227.

Type locality: Sciotel, Eritrea (Beccari).

46_1. Var. **occidentalis** Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 300 (☿, ♀). Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Type locality: Akra, Gold Coast (R. Buchholz).

46*a*. Subsp. **honorus** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 268 (☿).

Camponotus (Myrmotrema) foraminosus subsp. *honorus* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 268.

Type locality: Western Abyssinia (Ilg).

46*b*. Subsp. **osiris** Forel, 1911, Rev. Zool. Afr., I, p. 281 (☿).

Camponotus (Myrmotrema) olivieri subsp. *osiris* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

46*c*. Subsp. **puberulus** Emery, 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604 (☿); 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227. Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 268 (☿); 1911, Rev. Zool. Afr., I, p. 280; 1913, ibid., II, p. 341 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 136 (☿).

Camponotus carbo var. *puberula* Emery, 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63.

Camponotus (Myrmotrema) puberulus Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 271 and 278 (☿).

Type locality: Coromma, Abyssinia (Ruspoli).

Belgian Congo: Congo da Lemba (R. Mayné); Kwesi to Kilo (Bayer). Uganda: Unyoro Province, near Lake Albert (C. Alluaud). Western Abyssinia: (Ilg). Eritrea: Keren, between Saganeiti and Adi Ugri (Mancini and Ruggeri).

47. **Camponotus (Myrmotrema) compressiscapus** Ern. André. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus compressiscapus Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 218 (☿); 1890, ibid., IX, p. 312 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 225. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus (Myrmosericus) compressiscapus Forel, 1914, Rev. Suisse Zool., XXII, p. 268.

Type locality: Sierra Leone (Mocquerys).

48. **Camponotus (Myrmotrema) confluens** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus (Myrmamblys) confluens Forel, 1913, Rev. Zool. Afr., II, p. 342 (☿); 1914, Rev. Suisse Zool., XXII, p. 271.

Camponotus confluens Bequaert, 1913, Rev. Zool. Afr., II, p. 431.

Type locality: Welgelegen, Belgian Congo (J. Bequaert).

Belgian Congo: Sankisia (J. Bequaert).

48_1. Var. **bequaerti** Forel, 1913, Rev. Zool. Afr., II, p. 343 (☿, ♀). Bequaert, ibid., p. 431.

Type locality: Sankisia, Belgian Congo (J. Bequaert).

48_2. Var. **trematogaster** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 266 (☿).

Type locality: Lake Nyanza, Katanga, Belgian Congo (Gérard).

49. **Camponotus (Myrmotrema) crucheti** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Camponotus perrisii subsp. *crucheti* Santschi, 1911, Rev. Zool. Afr., I, p. 215 (☿, ♀, ♂).

Type locality: Cucala, Benguela (J. Cruchet).

50. **Camponotus (Myrmotrema) diplopunctatus** Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 22, fig. 12 (☿, ♀). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Nefasit, Eritrea (F. Silvestri).

Eritrea: Mayabal (F. Silvestri).

51. **Camponotus (Myrmotrema) foraminosus** Forel, 1914, Rev. Suisse Zool., XXII, p. 270; 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 350; 1916, Rev. Suisse Zool., XXIV, p. 443 (☿, ♀). Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 268 and 272. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258. See pp. 249 and 1050.

Camponotus niveosetosus Emery, 1877, Ann. Mus. Civ. Genova, IX, p. 364 (☿, ♀) (*nec* Mayr). Magretti, 1884, ibid., XXI, p. 537; 1884, Bull. Soc. Ent. Italiana, XV, (1883), p. 244 (☿, ♀) (*nec* Mayr).

Camponotus foraminosus Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 87 (☿); 1886, Ann. Soc. Ent. Belgique, XXX, p. 174 (☿). Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 358. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 231. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿). H. Kohl, 1909, Natur u. Offenbarung, LV, p. 102. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀). Forel, 1911, Sitzb. Bayer. Akad. Wiss., p. 291 (☿); 1913, Rev. Suisse Zool., XXI, p. 671 (☿).

Type locality: Cape Verde, Senegambia.

Southern Nigeria: Old Calabar (Bates). Cameroon: (Conradt). French Congo: Brazzaville (A. Weiss). Belgian Congo: Kimpoko (Büttner); St. Gabriel (Kohl); Faradje; Avakubi; Stanleyville; Bengamisa (Lang and Chapin). Anglo-Egyptian Sudan: Sebderat (Magretti). Eritrea: Keren (Beccari); Kor Lebka (Magretti). Cape Province: Cape of Good Hope (L. Péringuey).

51a. Subsp. **auropubens** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 67 (☿). Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 182 (☿); 1896, ibid., XXXVII, p. 159 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604 (☿, ♀). Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90. Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿). See p. 250.

Camponotus grandidieri subsp. *auropubens* Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150 (☿).

Camponotus (Myrmotrema) auropubens Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 267, 272, and 275.

Type locality: Delagoa Bay, Portuguese East Africa (Liengme).

Somaliland: Magala Re Umberto (Ruspoli); Lugh; Lower Ganale (V. Bottego). Abyssinia: Boran Galla, Middle Ganale (V. Bottego); Daua (Ruspoli). Natal: Stamford Hill (I. Trägårdh). Belgian Congo: Stanleyville (Lang and Chapin).

51a_1. Var. **absolon** (Santschi).

Camponotus (Myrmotrema) auropubens var. *absolon* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 267 and 274 (☿, ♀).

Type locality: Natal (I. Trägårdh).

51a_2. Var. **argentopubens** Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 66 (♀).

Camponotus (Myrmotrema) auropubens subsp. *argentopubens* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 268.

Type locality: Benguela (C. Wellman).

51a_3. Var. **jacob** (Santschi).

Camponotus (Myrmotrema) auropubens var. *jacob* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 267 and 275 (☿).

Type locality: Pongué Valley, Guengera, Mozambique (G. Vasse).

Rhodesia: Bulawayo (G. Arnold).

51*b*. Subsp. **benguelensis** Santschi, 1911, Rev. Zool. Afr., I, p. 213 (☿, ♀, ♂); 1915, Ann. Soc. Ent. France, LXXXIV, p. 269.

Type locality: Cucala, Benguela (J. Cruchet).

51*c*. Subsp. **chrysogaster** Emery, 1895, Ann. Mus. Civ. Genova, XXXV, p. 182 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 31; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90 (♀, ♂). Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 21 (♀). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 136 (☿); 1915, Ann. Soc. Ent. France, LXXXIV, p. 268.

Camponotus chrysogaster Emery, 1899, Ann. Mus. Civ. Genova, XXXIX, p. 501 (♀).

Type locality: Arussi Galla, Ganale Gudda, Abyssinia (V. Bottego).

Abyssinia: Budltu to Dumé (V. Bottego). Somaliland: Magala Re Umberto (Ruspoli). British East Africa: Blue Post Hotel, Kikuyu, 1520 m. (Alluaud and

Jeannel); Fundu Island, W. Pemba (Voeltzkow). GERMAN EAST AFRICA: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel); Kibonoto, Kilimanjaro; Ngare-na-Nyuki, Meru (Sjöstedt); Mto-ya-Kifaru (Katona). UGANDA: region of Lake Albert, southern Unyoro (C. Alluaud).

51c_1. Var. **annobonensis** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 268 and 277 (☿).

Camponotus (Myrmotrema) foraminosus var. *annobonensis* SANTSCHI, 1920, 'Études Maladies Parasites Cacaoyer S. Thomé,' X, p. 4.

Camponotus (Myrmotrema) perrisii var. *insularis* STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. (1910–11),' I, p. 399, fig. 12 (☿, ♀, ♂).

Type locality: ANNOBON (Reichensperger; Schultze).

51*d*. Subsp. **cuitensis** FOREL, 1901, Mitth. Schweiz. Ent. Ges., X, p. 309 (☿); in Baum, 1903, 'Kunene-Sambesi Expedition,' p. 563 (☿).

Camponotus (Myrmotrema) robbechii subsp. *troglodytes* var. *cuitensis* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Type locality: Between the Cubango and Cuito Rivers, MOSSAMEDES (Baum and Van der Kellen).

51*e*. Subsp. **delagoensis** FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 68 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Camponotus (Myrmotrema) olivieri var. *delagoensis* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (P. Berthoud; Liengme).

51*f*. Subsp. **flavus** STITZ, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 397, fig. 11 (☿).

Type locality: Fort Crampel, FRENCH CONGO (Schubotz).

51*g*. Subsp. **hæreticus** SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 382 (☿). See p. 250.

Camponotus (Myrmotrema) hæreticus SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 269.

Type locality: Olokemeji, SOUTHERN NIGERIA (F. Silvestri).

GOLD COAST: Aburi (F. Silvestri). BELGIAN CONGO: Lukolela (Lang and Chapin).

51*h*. Subsp. **lemma** FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 176 (☿, ♀). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 36. FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿).

Camponotus lemma DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 238.

Camponotus (Myrmotrema) olivieri var. *lemma* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Malange, ANGOLA (M. Buchner).

BELGIAN CONGO: Lukula (Daniel); Banza Masola; Mondombe; Ganda Sundi; Congo da Lemba (R. Mayné). ZANZIBAR: (Hildebrandt).

51h_1. Var. **infelix** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿).

Camponotus (Myrmotrema) olivieri subsp. *infelix* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Durban, NATAL (G. Arnold).

51h_2. Var. **moshianus** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 31 (☿).

Camponotus (*Myrmotrema*) *olivieri* var. *moshiana* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Moschi, German East Africa (Katona).

51*i*. Subsp. **orthodoxus** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 381 (☿).

Camponotus (*Myrmotrema*) *orthodoxus* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 267.

Type locality: Kindia, French Guinea (F. Silvestri).

51*j*. Subsp. **ruspolii** Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 349 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. Forel, 1914, Rev. Suisse Zool., XXII, p. 270. See p. 1050.

Camponotus ruspolii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 250.

Camponotus (*Myrmotrema*) *grandidieri* subsp. *ruspolii* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 269.

Camponotus (*Myrmotrema*) *ruspolii* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Somaliland (C. Keller).

51j_1. Var. **rollei** Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 270 (☿); 1913, Rev. Zool. Afr., II, p. 341 (☿). Bequaert, ibid., p. 430.

Camponotus (*Myrmotrema*) *grandidieri* subsp. *ruspolii* var. *rollei* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 269.

Type locality: Zoutpansberg, 800 m., northern Transvaal (Rolle).

Belgian Congo: Sankisia (J. Bequaert).

52. **Camponotus** (**Myrmotrema**) **galla** Forel. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 267. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus galla Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 68 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 604; 1899, ibid., XXXIX, p. 501 (☿). Mayr, in Jägerskiöld, 1903, 'Exped., IX, Formicid.,' p. 11; 1907, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., CXVI, Abt. 1, p. 389. Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 372.

Campanotus foraminosus subsp. *latinotus* Forel, 1907, Rev. d'Ent. Caen, XXVI, p. 144 (☿).

Camponotus erinaceus subsp. *galla* Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 271. Karawaiew, 1911, Rev. Russe Ent., XI, p. 12 (☿). Emery, 1915, Boll. Lab. Zool. Gen. Agrar. Portici, X, p. 4 (☿).

Campanotus (*Orthonotomyrmex*) *galla* Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Southern Abyssinia (Ilg).

Eritrea: Nefasit (K. Escherich); Mayabal (F. Silvestri). Abyssinia: Hauacio (Ruspoli); Upper Aouache-Endessa (de Rothschild); Bass Narok (V. Bottego). Anglo-Egyptian Sudan: Kaka, White Nile (I. Tragårdh); Renk (F. Werner); Khartum; Port Sudan (Karawaiew). British East Africa: Lake Rudolf (de Rothschild).

53. **Camponotus** (**Myrmotrema**) **grandidieri** Forel, 1914, Rev. Suisse Zool., XXII, p 270. Santschi, 1915, Ann. Soc Ent France, LXXXIV, pp. 268 and 272. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258. See p. 1059.

Camponotus grandidieri FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. ciii (☿). DISTANT, 1892, 'A Naturalist in the Transvaal,' p. 211. FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. MAYR, in Sjostedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 21.

Camponotus foraminosus subsp. *grandidieri* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿, ♀, ♂); 1913, Ann. Soc. Ent. Belgique, LVII, p. 145 (☿, ♂).

Camponotus foraminosus var. *grandidieri* (?) MAYR, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 195 (☿). H. STADELMANN, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 37.

GERMAN EAST AFRICA: Ngare na Nyuki, Meru (Sjöstedt). BRITISH EAST AFRICA: Fundu Island, W. Pemba (Voeltzkow). RHODESIA: Bulawayo (G. Arnold). PORTUGUESE EAST AFRICA: Quilimane (Stuhlmann); Mozambique Island (H. Brauns); Delagoa (Liengme). TRANSVAAL: Pretoria (Distant).

53$_1$. Var. **atrabilis** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 269 and 273 (☿). See p. 1051.

MOZAMBIQUE: Gorongoza (G. Vasse).

53a. Subsp. **mendax** (EMERY) SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 269 and 274 (☿).

Camponotus foraminosus subsp. *mendax* EMERY, 1895, Ann. Soc. Ent. France, LXIV, p. 54 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30 (☿, ♀).

Type locality: Hamman's Kraal, TRANSVAAL (E. Simon).

NATAL. CAPE PROVINCE: (Krebs). BECHUANALAND: Khakhea to Kang (L. Schultze). GERMAN SOUTHWEST AFRICA: (Lübbert).

54. **Camponotus** (**Myrmotrema**) **ilgi** FOREL, 1914, Rev. Suisse Zool., XXII, p. 270. SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus ilgii FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 64 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. SANTSCHI, 1913, Ann. Soc. Ent. Belgique, LVII, p. 314 (☿).

Type locality: SOUTHERN ABYSSINIA (Ilg).

SENEGAMBIA: St. Louis (Claveau).

55. **Camponotus** (**Myrmotrema**) **micipsa** WM. M. WHEELER. See p. 252 (☿).

Type locality: Between Leopoldville and Yumbi, BELGIAN CONGO (Lang and Chapin).

56. **Camponotus** (**Myrmotrema**) **olivieri** (FOREL) SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 270 and 272. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus foraminosus subsp. *olivieri* FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 175 (☿, ♀). MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393. FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 356 (☿).

Camponotus olivieri DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 246.

Type locality: Malange, ANGOLA (M. Buchner).

Gold Coast: Akra. French Congo: Gaboon (H. Brauns); Brazzaville (A. Weiss). Belgian Congo: Congo da Lemba (R. Mayné).

56_1. Var. **sorptus** (Forel) Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270. See p. 252.

Camponotus foraminosus subsp. *delagoensis* var. *sorpta* Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 62 (☿, ♀, ♂).

Type locality: Lower Congo, in stomach of *Manis temmincki* (Solon).

Belgian Congo: Kwamouth; Leopoldville; Lukolela; Stanleyville (Lang and Chapin).

56_2. Var **tenuipilis** (Emery) Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Camponotus foraminosus subsp. *olivieri* var. *tenuipilis* Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 54 (☿).

Type locality: Pretoria, Transvaal (E. Simon).

56*a*. Subsp. **concordia** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 269 and 272 (☿).

Type locality: Cucala, Benguela (J. Cruchet).

56*b*. Subsp. **tauricollis** (Forel) Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Camponotus foraminosus subsp. *tauricollis* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 68 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Type locality: Delagoa Bay, Portuguese East Africa (Liengme).

$56b_1$. Var. **pax** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 270 and 273 (☿).

Type locality: Cameroon.

57. **Camponotus (Myrmotrema) perrisi** Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 272. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus foraminosus subsp. *perrisii* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 177 (☿, ♀). H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 36.

Camponotus perrisii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 247.

Camponotus perrisi Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus foraminosus subsp. *perrini* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿).

Type locality: Malange, Angola (M. Buchner).

French Congo: (A. Weiss). British East Africa: Kitui (Hildebrandt).

57_1. Var. **densipunctatus** Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 399 (☿, ♂).

Type locality: Duma, Belgian Congo (Schubotz).

French Congo: Fort Crampel; Fort de Possel to Fort Crampel (Schubotz).

57*a*. Subsp. **jucundus** Santschi, 1911, Rev. Zool. Afr., I, p. 216 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 314; 1915, Ann. Soc. Ent. France, LXXXIV, p. 272. See p. 251.

Camponotus (*Myrmotrema*) *perrisii* subsp. *iucundus* Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 399 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

French Congo: Mandouga (A. Weiss). Belgian Congo: Ubangi; Banzyville (Augustin); Garamba; Faradje; Niangara; Kwamouth (Lang and Chapin); Kimuenza (Schultze).

57a_1. Var. **grandior** (FOREL) SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 272. See p. 252.

Camponotus (Myrmotrema) foraminosus subsp. *perrisii* var. *grandior* FOREL, 1913, Rev. Zool. Afr., II, p. 342 (☿).

Camponotus foraminosus subsp. *perrisii* var. *grandis* BEQUAERT, 1913, ibid., II, p. 431.

Type locality: Welgelegen, BELGIAN CONGO (J. Bequaert).

BELGIAN CONGO: Yakuluku; Garamba (Lang and Chapin).

57*b*. Subsp. **nigeriensis** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 272 and 277 (☿, ♀, ♂).

Camponotus (Myrmotrema) bayeri subsp. *nigeriensis* SANTSCHI, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 383 (☿).

Type locality: Ibadan, SOUTHERN NIGERIA (F. Silvestri).

SOUTHERN NIGERIA: Lagos (F. Silvestri). BELGIAN CONGO: Kitempuka; Kataki (Gérard).

58. **Camponotus (Myrmotrema) postoculatus** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿).

Type locality: Durban, NATAL (G. Arnold).

59. **Camponotus (Myrmotrema) rhamses** SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 268 and 275 (☿).

Type locality: Lake No, Upper EGYPT (Reichensperger).

60. **Camponotus (Myrmotrema) robecchii** EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus robecchii EMERY, 1892, Ann. Mus. Civ. Genova, XXXII, p. 120, fig. (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 250. EMERY, 1896, Mem. Accad. Sc. Bologna, (V) 5, p. 774; 1901, Bull. Soc. Ent. Italiana, XXXIII, p. 63 (♀).

Camponotus foraminosus subsp. *robecchii* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90 (☿).

Camponotus (Myrmotrema) foraminosus subsp. *robeccii* FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Camponotus (Myrmotrema) robbechii SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 271 and 272.

Type locality: Obbia, SOMALILAND (Bricchetti-Robecchi).

BRITISH EAST AFRICA: Chake-Chake, Pemba (Voeltzkow). ERITREA: Massaua (Belli).

61. **Camponotus (Myrmotrema) troglodytes** FOREL, 1914, Rev. Suisse Zool., XXII, p. 270; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 254 (☿). SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 40 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 137 (☿). EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus troglodytes FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 69 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (♀); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 29 (♀).

Camponotus (Myrmotrema) robbechii subsp. *troglodytes* SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Type locality: Delagoa Bay, PORTUGUESE EAST AFRICA (Liengme).

GERMAN SOUTHWEST AFRICA: (Lübbert). BECHUANALAND: Khakhea to Kang (L. Schultze); Grootfontein (v. Erffer). TRANSVAAL: Lydenburg (Wilms). CAPE

Province: Cape Town (Wilms). Zululand: Dukudu (I. Trägårdh). Natal: Durban (G. Arnold). British East Africa: Ramisi River (Alluaud and Jeannel). Abyssinia: Southern Danakil; Harar (Kachovskij).

61$_1$. Var. **abyssinicus** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 314 (♀).

Camponotus (*Myrmotrema*) *robbechii* subsp. *troglodytes* var. *abyssinica* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Type locality: Diré Daua, Abyssinia (J. Roger).

61$_2$. Var. **rhodesianus** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 145 (☿).

Camponotus (*Myrmotrema*) *robbechii* subsp. *rhodesiana* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 271.

Type locality: Redbank, Southern Rhodesia (G. Arnold).

Southern Rhodesia: Sebakwe (G. Arnold).

Subgenus 6. **Myrmopiromis** Wheeler

Camponotus subg. *Myrmopiromis* Wheeler, 1921, Psyche, XXVIII, p. 17.

Camponotus subg. *Myrmepomis* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 245 (not of Forel, 1912).

Subgenotype: *Formica fulvopilosa* De Geer, 1778.

62. **Camponotus** (**Myrmopiromis**) **conradti** Forel.

Camponotus (*Camponotus*) *conradti* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 256 (☿).

Camponotus (*Myrmopomis*) *conradti* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Cameroon (Conradt).

63. **Camponotus** (**Myrmopiromis**) **fulvopilosus** (De Geer).

Formica fulvopilosa DeGeer, 1778, 'Mém. Hist. Ins.,' VII, p. 613, Pl. xlv, figs. 13, 14. Gœze, in DeGeer, 1783, 'Abh. Gesch. Insekt.,' VII, p. 218 (☿), Pl. xlv, figs. 13, 14. Retzius, 1783, 'Gen. et Spec. Insect.,' p. 75. Lepeletier, 1836, 'Hist. Nat. Ins. Hym.,' I, p. 213. F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 32.

Formica pilosa Olivier, 1791, 'Encycl. Méthod. Insect.,' VI, p. 498.

Formica rufiventris Fabricius, 1804, 'Syst. Piez.,' p. 409 (☿).

Camponotus fulvopilosus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 668 (☿); 1863, ibid., XIII, p. 399. Roger, 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidae, p. 36. Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 108 (☿); 1886, Ann. Soc. Ent. Belgique, XXX, p. 192 (☿). Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 356 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 232. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 54. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 150. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1900, Bull. Soc. Ent. Italiana, XXXII, p. 117, fig. 12 (☿). Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 63 (☿). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 349 and 363. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿, ♂).

Camponotus (*Myrmepomis*) *fulvopilosus* Forel, 1914, Rev. Suisse Zool., XXXII, p. 273. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Cape of Good Hope.

Cape Province: Kimberley (E. Simon); Tulbagh. Basutoland: Lessouto (P. Berthoud). German Southwest Africa: (Lübbert); Okahandja (Casper; Peters); Grootfontein (v. Erffer); Windhoek (Kunze and L. Schultze); Bethanien (Schenck); Salem (L. Schultze). Portuguese Congo: Chinchoxo (Falkenstein). Benguela. Rhodesia: Victoria Falls; Tsessebe Station (Dixey and Longstaff).

63_1. Var. **detritoides** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿).

Type locality: Glatkop, Little Namaland, Cape Province (L. Schultze).

63_2. Var. **flavopilosus** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 54 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿, ♂); 1911, Sitzb. Bayer. Akad. Wiss., p. 291 (☿). Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 2 (☿).

Type locality: De Aar, Cape Province (E. Simon).

German Southwest Africa: (G. v. Bayern); Salem; Kubub (L. Schultze). Cape Province: Namaland (L. Péringuey). Bechuanaland: Kooa (L. Schultze). Belgian Congo: Luapula River.

63a. Subsp. **brevisetosus** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 25 (☿, ♀).

Type locality: Natal (Haviland).

Cape Province: Cape Town (Wilms).

63*b*. Subsp. **detritus** (Emery) Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 26 (☿).

Camponotus detritus Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 357 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 228. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Camponotus (Myrmepomis) detritus Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Damaraland, German Southwest Africa.

German Southwest Africa: Rooibank near the Walfish Bay (L. Schultze).

63*c*. Subsp. **storeatus** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 26 (☿).

Type locality: Willowmore, Cape Province (H. Brauns).

64. **Camponotus (Myrmopiromis) maynei** Forel.

Camponotus (Orthonotomyrmex) maynei Forel, 1916, Rev. Suisse Zool., XXIV, p. 445 (☿, ♀).

Camponotus (Myrmepomis) maynei Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Belgian Congo (R. Mayné).

65. **Camponotus (Myrmopiromis) niveosetosus** Mayr. See p. 1052.

Camponotus niveosetosus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 665 (☿); 1863, ibid., XIII, p. 400. Roger, 1863, 'Verzeich. Formicid.,' p. 2. Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 35 (☿, ♀), Pl. i, fig. 3; 1866, Verh. Zool. Bot. Ges. Wien, XVI, p. 885 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 245. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 55; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿); in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30 (☿).

Camponotus (Myrmoturba) niveosetosus Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Camponotus (Myrmepomis) niveosetosus Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Cape of Good Hope (Novara Expedition).

CAPE PROVINCE: Cape Town (E. Simon). BECHUANALAND: Lehututu (L. Schultze). GERMAN SOUTHWEST AFRICA: (L. Schultze). BRITISH EAST AFRICA: Fundu Island, W. Pemba (Voeltzkow).

65a. Subsp. **irredux** FOREL, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 451.

Camponotus (*Myrmoturba*) *niveosetosus* var. *irredux* SANTSCHI, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿).

Type locality: NATAL (R. C. Wroughton).

NATAL: (Haviland); Pietermaritzburg (I. Trägårdh).

Subgenus 7. **Myrmorhachis** FOREL

Camponotus subg. *Myrmorhachis* FOREL, 1912, Mém. Soc. Ent. Belgique, XX, p. 92.

Camponotus subg. *Myrmacantha* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 246.

Subgenotype: *Camponotus polyrhachioides* Emery, 1898.

66. **Camponotus** (**Myrmorhachis**) **aberrans** MAYR. FOREL, 1914, Rev. Suisse Zool., XXII, p. 274. SANTSCHI, 1915, Ann. Soc. Ent. France, LXXXIV, p. 264 (☿).

Camponotus aberrans MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 152 (♀). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿).

Camponotus (*Myrmacantha*) *aberrans* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: GOLD COAST.

FRENCH CONGO: Brazzaville (A. Weiss). BELGIAN CONGO: Kitempuka (Gérard).

67. **Camponotus** (**Myrmorhachis**) **polyrhachioides** EMERY. FOREL, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿); 1914, Rev. Suisse Zool., XXII, p. 274. See p. 254.

Polyrhachis paradoxa ERN. ANDRÉ, 1892, Rev. d'Ent. Caen, XI, p. 46 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 266. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 153. ERN. ANDRÉ, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 778.

Camponotus polyrhachioides EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227; 1900, Bull. Soc. Ent. Italiana, XXXII, p. 117, fig. 11a (☿). FOREL, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 74 (☿). SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿).

Camponotus paradoxus STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀) (*nec Camponotus paradoxus* Mayr, 1866).

Camponotus (*Myrmacantha*) *polyrhachioides* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Gaboon, FRENCH CONGO.

SIERRA LEONE. LIBERIA: Grand Bassa (H. Brauns). CAMEROON: Mundame (Conradt); Longji (Paschen). FRENCH CONGO: Ogowe (Mocquerys); Sette-Cama (Hupfer); Brazzaville (A. Weiss). BELGIAN CONGO: Mayombe; Kinati (R. Mayné); Lie; Lukolela (Lang and Chapin).

Subgenus 8. **Myrmopsamma** Forel

Camponotus subg. *Myrmopsamma* Forel, 1914, Rev. Suisse Zool., XXII, p. 261. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 246.

Subgenotype: *Camponotus mystaceus* Emery, 1886.

68. **Camponotus** (**Myrmopsamma**) **cuneiscapus** Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus cuneiscapus Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 29 (☿), Pl. i, fig. 2.

Type locality: Steinkopf, Cape Province (L. Schultze).

69. **Camponotus** (**Myrmopsamma**) **mystaceus** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus mystaceus Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 356 (☿, ♂), Pl. xvii, fig. 3. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 244. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27 (☿).

Type locality: Cape of Good Hope (L. Péringuey).

German Southwest Africa: Okahandja (Casper); Windhoek (L. Schultze). Bechuanaland: Severelela to Khakhea; Kang to Lehututu; Kooa to Sekgoma (L. Schultze).

69₁. Var. **exsanguis** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 28 (☿, ♀, ♂).

Type locality: Prince of Wales Bay, South of Lüderitzbucht, German Southwest Africa (L. Schultze).

Cape Province: Steinkopf (L. Schultze).

69₂. Var. **kamæ** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 27 (☿).

Type locality: Rooibank, near Walfish Bay, German Southwest Africa (L. Schultze).

70. **Camponotus** (**Myrmopsamma**) **simulans** Forel, 1914, Rev. Suisse Zool., XXII, p. 270. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus simulans Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 28 (☿), Pl. i, fig. 4.

Type locality: Prince of Wales Bay, south of Lüderitzbucht, German Southwest Africa (L. Schultze).

Subgenus 9. **Myrmamblys** Forel

Camponotus subg. *Myrmamblys* Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 90.

Camponotus subg. *Myrmotemnus* Emery, 1920, (in part), Rev. Zool. Afr., VIII, p. 246.

Subgenotype: *Camponotus reticulatus* Roger, 1863.

71. **Camponotus** (**Myrmamblys**) **bedoti** Emery.

Camponotus bedoti Emery, 1893, Rev. Suisse Zool., I, p. 196 (☿), Pl. viii, fig. 2.

Type locality: Batjan, Moluccas (Bedot).

Malaysia.

71_1. Var. **klugi** Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 51 (☿).

Camponotus reticulatus subsp. *yerburyi* var. *klugi* Emery, 1895, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Type locality: Cape Town, Cape Province (E. Simon).

72. **Camponotus (Myrmamblys) bertolonii** Emery.

Camponotus bertolonii Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 51 (☿, ♀); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771. Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 28 (☿, ♀, ♂).

Camponotus (Myrmoturba) bertolonii Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Camponotus (Myrmotemnus) bertolonii Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Cape Town, Cape Province (E. Simon).

Cape Province: Port Elizabeth (H. Brauns).

73. **Camponotus (Myrmamblys) brookei** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 259 (☿).

Type locality: Stella Bush, Durban, Natal (Marley).

74. **Camponotus (Myrmamblys) chapini** Wm. M. Wheeler. See p. 254 (☿).

Type locality: Garamba, Belgian Congo (Lang and Chapin).

Belgian Congo: Medje; Faradje (Lang and Chapin).

75. **Camponotus (Myrmamblys) emarginatus** Emery.

Camponotus emarginatus Emery, 1886, Bull. Soc. Ent. Italiana, XVIII, p. 358 (☿, ♀, ♂), Pl. xvii, fig. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (Myrmophyma) emarginatus Forel, 1914, Rev. Suisse Zool., XXII, p. 269.

Camponotus (Myrmotemnus) emarginatus Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Cape of Good Hope, Cape Province (L. Péringuey).

76. **Camponotus (Myrmamblys) ferreri** Forel, 1914, Rev. Suisse Zool., XXII, p. 271.

Camponotus ferreri Forel, 1913, ibid., XXI, p. 671 (♀).

Type locality: Cameroon (Conradt).

76a. Subsp. **akka** Forel, 1916, Rev. Suisse Zool., XXIV, p. 446 (☿, ♀).

Type locality: Belgian Congo (Kohl).

77. **Camponotus (Myrmamblys) limbiventris** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 134 (☿).

Camponotus limbiventris Santschi, 1910, Ann. Soc. Ent. France, LXXIX, p. 366, fig. (☿).

Camponotus (?Myrmotemnus) limbiventris Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Kibosho, Mt. Kilimanjaro, German East Africa (C. Alluaud).

British East Africa: Amboni River, Mt. Kenia, 1800 m. (Alluaud and Jeannel).

78. **Camponotus (Myrmamblys) nasutus** Emery.

Camponotus nasutus Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 53 (☿), Pl. ii, fig. 27; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (Myrmophyma) nasutus Forel, 1914, Rev. Suisse Zool., XXII, p. 269.

Camponotus (*Myrmotemnus*) *nasutus* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Pretoria, Transvaal (E. Simon).

78_1. Var. **quinque-dentatus** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 451 (☿).

Type locality: Natal (Haviland).

79. **Camponotus** (**Myrmamblys**) **orinobates** Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 348, fig. 4c (☿).

Camponotus (*Myrmamblys*) *bertolonii* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 134 (☿) (*nec* Emery).

Type locality: eastern slope of Mt. Kenia, British East Africa (Alluaud and Jeannel).

British East Africa: River Amboni, 1800 m.; Kijabe, Kikuyu Escarpment, 2100 m. (Alluaud and Jeannel).

80. **Camponotus** (**Myrmamblys**) **schoutedeni** Forel.

Camponotus schoutedeni Forel, 1911, Rev. Zool. Afr., I, p 281 (☿); 1912, Ent. Mitt. Deutsch. Ent. Mus. Berlin, I, p. 83; 1913, Ann. Soc. Ent. Belgique, LVII, pp. 146 (☿) and 357 (☿).

Camponotus (*Myrmosaga*) *schoutedeni* Forel, 1913, Rev. Zool. Afr., II, p. 347 (☿); 1914, Rev. Suisse Zool., XXII, p. 269. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 137 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

Belgian Congo: Banza Masola; Yandumba; Ganda Sundi; Mandungu; Yambata; Kiniati (R. Mayné); Beni (Borgerhoff). Benguela: (C. Wellman). Rhodesia: Redbank (G. Arnold). German East Africa: New Moschi, Mt. Kilimanjaro, 800 m. (Alluaud and Jeannel). British East Africa: Likoni; Shimoni; Kikuyu Escarpment (Alluaud and Jeannel).

81. **Camponotus** (**Myrmamblys**) **simus** Emery. Forel, 1914, Rev. Suisse Zool., XXII, p. 272.

Camponotus simus Emery, 1908, Ann. Soc. Ent. Belgique, LII, p. 188, fig. 2 (♃, ☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿).

Camponotus (*Myrmotemnus*) *simus* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Sankuru, Belgian Congo (Luja).

French Congo: Brazzaville (A. Weiss).

81a. Subsp. **manidis** Forel, 1911, Rev. Zool. Afr., I, p. 282 (☿).

Camponotus manidis Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 62 (☿).

Type locality: Lower Congo, in stomach of *Manis temmincki* (Solon).

82. **Camponotus** (**Myrmamblys**) **viri** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 265, fig. 13 (♀).

Camponotus (*Myrmotemnus*) *viri* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Mombasa, British East Africa.

Subgenus 10. **Colobopsis** Mayr

Colobopsis Mayr, 1861, 'Europ. Formicid.,' p. 38.

Camponotus subg. *Colobopsis* Emery, 1889, Ann. Mus. Civ. Genova, XXVII, p. 517. Forel, 1912, Mém. Soc. Ent. Belgique, XX, p. 90; 1914, Rev. Suisse Zool., XXII, p. 263. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 247.

Subgenotype: *Formica truncata* Spinola, 1808.

83. **Camponotus (Colobopsis) bifossus** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 293 (♃).

Type locality: Caledon, Cape Province (L. Péringuey).

Species Incertæ Sedis

84. **Camponotus æquitas** Santschi.[1]

Camponotus (Myrmamblys) æquitas Santschi, 1920, Ann. Soc. Ent. France, LXXXVIII, (1919), p. 387, fig. 16 (☿, ♀, ♂).

Type locality: Bulawayo, Rhodesia (G. Arnold).

85. **Camponotus berthoudi** Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 108 (☿), Pl. I, fig. 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 222. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Camponotus (Myrmamblys) berthoudi Forel, 1914, Rev. Suisse Zool., XXII, p. 271.

Type locality: Valdezia, Transvaal (P. Berthoud).

86. **Camponotus buchholzi** Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 297 (☿, ♀).

Camponotus (Myrmamblys) buchholzi Forel, 1914, Rev. Suisse Zool., XXII, p. 271.

Type locality: Victoria, Cameroon (R. Buchholz).

86_1. Var. **furvus** Santschi, 1911, Rev. Zool. Afr., I, p. 213 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

87. **Camponotus dewitzi** Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 187 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 228. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus (Myrmosaga) dewitzii Forel, 1914, Rev. Suisse Zool., XXII, p. 269.

Type locality: Chinchoxo, Portuguese Congo (Falkenstein).

88. **Camponotus favorabilis** Santschi.

Camponotus (Myrmosaga) favorabilis Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 349 (☿).

Type locality: Nyamandloru, Rhodesia (G. Arnold).

89. **Camponotus jeanneli** Santschi.

Camponotus (Myrmosaga) jeanneli Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 137, fig. 30 (☿).

Type locality: Mombasa, British East Africa (Alluaud and Jeannel).

British East Africa: Likoni; Ramisi; Tchania River, Kikuyu, 1520 m. (Alluaud and Jeannel).

90. **Camponotus lilianæ** Forel. Bequaert, 1913, Rev. Zool. Afr., II, p. 431.[2]

Camponotus (Myrmamblys) lilianæ Forel, 1913, ibid., II, p. 344 (☿); 1914, Rev. Suisse Zool., XXII, p. 271. Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 134 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

British East Africa: Mbuyuni, Pori, 1150 m.; Taveta, 750 m. (Alluaud and Jeannel).

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[1] Placed by Santschi (1921) in the subgenus *Myrmosphincta*.

[2] Placed by Santschi (1921) in the subgenus *Myrmamblys*.

90a. Subsp. **cornutus** Forel, 1913, Rev. Zool. Afr., II, p. 345 (☿).

Type locality: Elisabethville, Belgian Congo (J. Bequaert).

91. **Camponotus orinodromus** Santschi.

Camponotus (Myrmamblys) orinodromus Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 347, fig. 4*e* (☿).

Type locality: Mt. Matroosberg, Cape Province (R. W. Tucker).

92. **Camponotus orites** Santschi.

Camponotus (Myrmamblys) orites Santschi, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 346, fig. 4*d* (☿).

Type locality: Mt. Matroosberg, Cape Province (R. W. Tucker).

93. **Camponotus ostiarius** Forel.

Camponotus (Myrmamblys) ostiarius Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 258 (☿).

Type locality: Durban, Natal (G. Arnold).

94. **Camponotus yvonnæ** Forel.[1]

Camponotus (Myrmamblys) yvonnæ Forel, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 480 (♀).

Type locality: Stanleyville, Belgian Congo (Kohl).

Phasmomyrmex Stitz

Phasmomyrmex Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 146. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 252.

Camponotus subg. *Phasmomyrmex* Forel, 1914, Rev. Suisse Zool., XXII, p. 264.

Genotype: *Camponotus buchneri* Forel, 1886 (= *Phasmomyrmex sericeus* Stitz, 1910).

1. **Phasmomyrmex buchneri** (Forel) Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 260. See p. 256.

Camponotus buchneri Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 183 (☿). Ern. André, 1892, Rev. d'Ent. Caen, XI, p. 45 (☿); Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 151 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1900, Bull. Soc. Ent. Italiana, XXXII, p. 116, fig. 10 (☿). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 421 (☿); 1913, Rev. Suisse Zool., XXI, p. 671 (☿).

Phasmomyrmex sericeus Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 146, fig. 11 (☿).

Camponotus (Phasmomyrmex) buchneri Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Malange, Angola (M. Buchner).

Cameroon: Mundame (Conradt); Lomie (Thesing). French Congo: Lugny (H. Brauns). Belgian Congo: Lukolela; Avakubi; Medje (Lang and Chapin); Lubutu (J. Bequaert).

Polyrhachis F. Smith[2]

Polyrhachis F. Smith, 1858, Journ. Proc. Linn. Soc. London, Zool., II, p. 58. Roger, 1861, Berlin. Ent. Zeitschr., V, p. 174.

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[1] Placed by Santschi (1921) in his subgenus *Myrmopelta*.

[2] I have been unable to find the description of *Polyrhachis setulosus* "Smith" recorded from Angola (Welwitsch) by Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 197.

Hoplomyrmus GERSTÆCKER, 1858, Monatsb. Ak. Wiss. Berlin, p. 262.
Formica FABRICIUS, LATREILLE, DRURY, etc.
Genotype: ***Formica bihamata*** Drury, 1773.

Subgenus 1. **Cyrtomyrma** FOREL

Polyrhachis subg. *Cyrtomyrma* FOREL, 1915, Arkiv f. Zool., IX, No. 16, p. 107.
Subgenotype: *Formica rastellata* Latreille, 1802.

1. **Polyrhachis (Cyrtomyrma) alexisi** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 455, fig. 7 (☿).

Type locality: BELGIAN CONGO (Kohl).

2. **Polyrhachis (Cyrtomyrma) kohli** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 454 (☿, ♀).

Type locality: BELGIAN CONGO (Kohl).

Subgenus 2. **Myrma** BILLBERG

Myrma BILLBERG, 1820, 'Enumer. Insect.,' p. 104. WHEELER, 1911, Science, N. S., XXXIII, p. 859.

Hoplomyrmus GERSTÆCKER, 1858, Monatsb. Ak. Wiss. Berlin, p. 262; in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 507.

Subgenotype: *Formica militaris* FABRICIUS, 1781.

3. **Polyrhachis (Myrma) ænescens** STITZ.

Polyrhachis ænescens STITZ, 1910, Mitt. Zool. Mus. Berlin, V, p. 151 (☿).

Type locality: CAMEROON (v. Knobloch).

4. **Polyrhachis (Myrma) aërope** WM. M. WHEELER. See p. 265 (☿).

Type locality: Niangara, BELGIAN CONGO (Lang and Chapin).

5. **Polyrhachis (Myrma) alluaudi** EMERY.

Polyrhachis alluaudi EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 567 (☿), Pl. XV, figs. 9 and 10 (nest). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 258. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Assinie, IVORY COAST (C. Alluaud).

5₁. Var. **anteplana** FOREL, 1916, Rev. Suisse Zool., XXIV, p. 448 (☿). See p. 266.

Type locality: BELGIAN CONGO (Kohl).

BELGIAN CONGO: Stanleyville (Lang and Chapin).

6. **Polyrhachis (Myrma) arnoldi** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 263 (☿).

Type locality: Durban, NATAL (G. Arnold).

7. **Polyrhachis (Myrma) atalanta** WM. M. WHEELER. See p. 263 (♀).

Type locality: Stanleyville, BELGIAN CONGO (Lang and Chapin).

8. **Polyrhachis (Myrma) bequaerti** WM. M. WHEELER. See p. 267 (☿).

Type locality: Utiasiki, between Lubutu and Kirundu, BELGIAN CONGO (J. Bequaert).

9. **Polyrhachis (Myrma) concava** ERN. ANDRÉ. FOREL, 1916, Rev. Suisse Zool., XXIV, p. 448 (☿, ♀). See p. 265.

Polyrhachis concava ERN. ANDRÉ, 1889, Rev. d'Ent. Caen, VIII, p. 218 (☿); 1892, ibid., XI, p. 45 (☿, ♀). DALLA TORRE, 1893, 'Cat Hym.,' VII, p. 260. MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 154 (☿). EMERY, 1896, Mem. Accad. Sc.

Bologna, (5) V, p. 777. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 61 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 282 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 359 (☿).

Type locality: Sierra Leone (Mocquerys).

Cameroon: (H. Brauns); Mundame (Conradt); Bibundi (Tessmann); Yaunde (Zenker). French Congo: Gaboon. Belgian Congo: (Kohl); Congo da Lemba; Mondombe (R. Mayné); Lower Congo, in stomach of *Manis temmincki* (Solon); Stanleyville; Akenge (Lang and Chapin).

10. **Polyrhachis** (**Myrma**) **consimilis** F. Smith.

Polyrhachis consimilis F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 73 (☿), Pl. iv, figs. 30 and 31. Roger, 1863, 'Verzeich. Formicid.,' p. 6. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 444; 1886, ibid., XXXVI, p. 357. Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 286 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 260. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 779.

Type locality: Sierra Leone (D. F. Morgan).

11. **Polyrhachis** (**Myrma**) **cornuta** Stitz.

Polyrhachis cornuta Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 150 (☿).

Type locality: Kimpoko, Belgian Congo (Büttner).

12. **Polyrhachis** (**Myrma**) **cubaënsis** Mayr.

Polyrhachis cubaënsis Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 686 (☿); 1863, ibid., XIII, p. 444. Roger, 1863, 'Verzeich. Formicid.,' p. 9. Emery, 1889, Bull. Soc. Ent. Italiana, XXI, p. 69. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 261. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Port Natal, Natal (described as from Cuba by Mayr).

12_1. Var. **striolato-rugosa** Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 196 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Polyrachis cubaënsis var. *striolato-rugosa* H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38.

Type locality: Zanzibar (Stuhlmann).

12*a*. Subsp. **durbanensis** Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 262 (☿, ♀).

Type locality: Durban, Natal (C. B. Cooper).

12*b*. Subsp. **gallicola** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 71 (☿, ♀). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿).

Type locality: Delagoa, Portuguese East Africa (Liengme).

British East Africa: Chake Chake, Pemba Island (Voeltzkow).

12*c*. Subsp. **gerstæckeri** (Forel) Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Polyrhachis gerstæckeri Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 197 (☿). Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 287. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 262. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 196.

Polyrhachis cubaënsis var. *gerstæckeri* Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 71.

Polyrachis gerstäckeri H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38.

Type locality: Zanzibar (Hildebrandt).

Portuguese East Africa: Delagoa Bay (Liengme).

12*d.* Subsp. **wilmsi** Forel, in Schultze, 1910, 'Forschungsreise in Südafrika,' IV, p. 30 (☿).

Type locality: Lobombo Borges, Mozambique (Wilms).

13. **Polyrhachis (Myrma) curta** Ern. André.

Polyrhachis curta Ern. André, 1890, Rev. d'Ent. Caen, IX, p. 312 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 261. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Sierra Leone (Mocquerys).

14. **Polyrhachis (Myrma) decemdentata** Ern. André. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 351 (☿, ♀, ♂); 1916, Rev. Suisse Zool., XXIV, p. 450 (♀). See p. 267.

Polyrhachis decemdentata Ern. André, 1889, Rev. d'Ent. Caen, VIII, p. 219 (☿). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 261. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿, ♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 153 (☿, ♀). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 300 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿). Forel, 1911, Rev. Zool. Afr., I, p. 282 (♀); 1913, Rev. Suisse Zool., XXI, p. 673 (♀).

Type locality: Sierra Leone (Mocquerys).

French Guinea: Los Islands (H. Brauns). Sierra Leone: Sherbro Island (H. Brauns). Ivory Coast: Assinie (C. Alluaud). Cameroon: (Conradt); Bibundi (Tessmann). Fernando Po: (R. Buchholz). French Congo: Ogowe (Mocquerys). Belgian Congo: Congo da Lemba (R. Mayné); St. Gabriel (Kohl); Stanleyville (Lang and Chapin); Malela (J. Bequaert).

14_1. Var. **fernandensis** Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 377 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 396 (☿, ♀).

Type locality: Fernando Po (Conradt).

French Congo: Brazzaville (A. Weiss).

14_2. Var. **flavipes** Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀).

Type locality: Victoria, Cameroon (Faber).

15. **Polyrhachis (Myrma) fissa** Mayr.

Polyrhachis fissus Mayr, 1902, Verh. Zool. Bot. Ges. Wien, LII, p. 301 (☿, ♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 149 (☿, ♀).

Type locality: Victoria, Cameroon (R. Buchholz).

Cameroon: Bibundi (Tessmann); Mundame (Conradt). Spanish Guinea: Nkolentanga (Tessmann).

16. **Polyrhachis (Myrma) gagates** F. Smith. Santschi, 1914 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 139 (☿). See p. 262.

Polyrhachis gagates F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 71 (☿). Pl. iv, fig. 14. Roger, 1863, 'Verzeich. Formicid.,' p. 6. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 444. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 354; 1873, in 'v. d. Decken's Reisen in Ost Afrika, Gliederthiere,' p. 342 (☿). Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 117 (☿); 1886, Ann. Soc. Ent. Belgique, XXX, p. 194 (☿, ♀). Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 357. Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 262. Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 184. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. Mayr, 1895, Ann.

Naturh. Hofmus. Wien, X, p. 154. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Mayr, in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 22. Dixey and Longstaff, 1907, Trans. Ent. Soc. London, p. 375. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 54. Zavattari, 1909, 'Il Ruwenzori, Parte Scientif.,' I, p. 215 (☿). Stitz, 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 392 (☿). Forel, 1913, Rev. Zool. Afr., II, p. 349 (☿).

Polyrachis gagates H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38.

Type locality: Port Natal, Natal.

Belgian Congo: Zambi (Lang and Chapin); Boma (H. Brauns); Beni (Borgerhoff); Kasindi (Schubotz). Angola: Malange (M. Buchner). Uganda: Katende (Duke of Abruzzi). British East Africa: Mombasa (v. d. Decken); Kitui (Hildebrandt); Chake Chake, Pemba Island (Voeltzkow). German East Africa: Tanga (H. Brauns; Alluaud and Jeannel); Mt. Kilimanjaro (Bornemisza); Kibonoto, Mt. Kilimanjaro, 1000–1200 m.; Mombo, Usambara (Sjöstedt); Rosako, Usaramo (Stuhlmann). Zanzibar: (Hildebrandt). Portuguese East Africa: Delagoa (Liengme). Transvaal: Valdezia (P. Berthoud). Cape Province: East London (Dixey and Longstaff).

16a. Subsp. **indefinita** Forel, 1913, Rev. Zool. Afr., II, p. 349 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 147 (☿).

Polyrhachis gagates var. *indefinita* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 42 (☿). Trägårdh, ibid., p. 47.

Polyrhachis (*Myrma*) *gagates* var. *indefinita* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 139 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Natal: Amanzimtoti (I. Trägårdh). Southern Rhodesia: Sebakwe (G. Arnold). British East Africa: Voi, Wa-Taita, 600 m. (Alluaud and Jeannel).

17. **Polyrhachis** (**Myrma**) **gamai** Santschi, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 295 (♀).

Type locality: Durban, Natal (Marley).

18. **Polyrhachis** (**Myrma**) **laboriosa** F. Smith. Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 384 (☿). Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 351 (☿); 1916, Rev. Suisse Zool., XXIV, p. 447 (☿, ♀). See p. 258.

Polyrhachis laboriosus F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 72 (☿), Pl. iv, figs. 21 and 22. Roger, 1863, 'Verzeich. Formicid.,' p. 6. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 445. Radoszkowsky, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. 31, p. 197. Mayr, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 357. Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 195 (☿). Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 286 (☿). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 264. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 153 (♀); 1896, Ent. Tidskr., XVII, pp. 250 (♀) and 255, Pl. iv, fig. 3 (nest). Sjöstedt, 1904, 'I Vastafrikas Urskogar,' p. 501, fig. 3 (nest). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 393 (☿, ♀, ♂). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 151 (☿, ♀). Forel, 1911, Rev. Zool. Afr., I, p. 282 (☿). Wasmann, 1911, 1er Congr. Intern. Entom. Bruxelles (1910), II, Mém., p. 231, Pl. xvi, fig. 33 (nest); 1913, Ann. Rept. Smiths. Inst. for 1912, p. 472, Pl. x, fig. 33 (nest). Forel, 1913, Rev. Zool. Afr., II, p. 349 (☿).

Polyrachis laboriosa M. L. Sykes, 1900, Trans. Manchester Microsc. Soc., XX, (1899), p. 88 (nest).

Type locality: Sierra Leone (D. F. Morgan).

Ivory Coast: Assinie (C. Alluaud). Gold Coast: (Ganger). Togo: Bismarckburg (Conradt). Southern Nigeria: Lagos (F. Silvestri). Cameroon: (Sjöstedt; H. Brauns); Bipindi (Zenker); Bibundi (Tessmann). Spanish Guinea: Alen (Tessmann). French Congo: Cape Lopez (H. Brauns); Brazzaville (A. Weiss). Portuguese Congo: Chinchoxo (Falkenstein). Belgian Congo: Congo da Lemba (R. Mayné); Kondué (Luja); St. Gabriel; Tshopo River near Stanleyville (Kohl); Stanleyville; Bafwasende; Niangara (Lang and Chapin). Angola: (Welwitsch).

19. **Polyrhachis (Myrma) lanuginosa** Santschi.

Polyrhachis lanuginosa Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 394, fig. 17 (☿).

Type locality: Mindouli, French Congo (A. Weiss).

20. **Polyrhachis (Myrma) lauta** Santschi.

Polyrhachis lauta Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 397, fig. 19 (♀). Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 450 (♀).

Type locality: Brazzaville, French Congo (A. Weiss).

20a. Var. **localis** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 359 (♀).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

21. **Polyrhachis (Myrma) maynei** Forel.

Polyrhachis maynei Forel, 1911, Rev. Zool. Afr., I, p. 282 (☿).

Type locality: Congo da Lemba, Belgian Congo (R. Mayné).

22. **Polyrhachis (Myrma) militaris** (Fabricius). See p. 260.

Formica militaris Fabricius, 1781, 'Spec. Insect.,' I, p. 493 (♀); 1787, 'Mantissa Insect.,' I, p. 310 (♀). Gmelin, in Linnæus, 1790, 'Syst. Nat.,' Ed. 13, I, 5, p. 2802. Olivier, 1791, 'Encycl. Méthod. Insect.,' VI, p. 499. Fabricius, 1793, 'Ent. Syst.,' II, p. 362 (♀). Latreille, 1802, 'Hist. Nat. Fourmis,' p. 124 (♀), Pl. iv, fig. 22. Fabricius, 1804, 'Syst. Piez.,' p. 414 (♀).

Polyrhachis militaris F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 72 (♂), Pl. iii, fig. 5 and Pl. iv, fig. 36. Roger, 1863, 'Verzeich. Formicid.,' p. 6. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 445; 1866, ibid., XVI, p. 886 (☿). Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 119 (☿, ♀, ♂); 1886, Ann. Soc. Ent. Belgique, XXX, p. 194 (☿, ♀). Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 265. H. Stadelmann, 1893, Mitth. Deutsch Schutzgeb., VI, p. 217. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 113 (♀); Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿, ♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 154 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Mayr, 1896, Ent. Tidskr., XVII, p. 252 (☿). Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿). Sjöstedt, 1904, 'I Vastafrikas Urskogar,' p. 507. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 16 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 73 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 150 (☿, ♀). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 372; 1913, Rev. Suisse Zool., XXI, p. 672 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿).

Polyrachis militaris H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38. M. L. Sykes, 1900, Trans. Manchester Microsc. Soc., XX, (1899), p. 91.

Type locality: Tropical Africa.

Sierra Leone: Samlia Falls, N'Gamie River (Mocquerys). Togo: Bismarckburg (Büttner). Southern Nigeria: Old Calabar (H. Brauns). Cameroon: Bibundi (Tessmann); Longji (Paschen); Yaunde (Scheunemann); Mundame (Conradt). Fernando Po: (Conradt). French Congo: Ogowe (Mocquerys). Portuguese Congo: Chinchoxo (Falkenstein). Belgian Congo: Mayombe (de Briey); Congo da Lemba (R. Mayné); Sankuru (Luja); Leopoldville; Lukolela; Lie; Stanleyville; Avakubi; Lubila; Panga; Medje; Ngayu; Boyulu (Lang and Chapin). Portuguese East Africa: Delagoa (Liengme); Mozambique (Fornasini). German East Africa: Tanga (Zimmer); Barikiwa (Ch. Schröder).

22_1. Var. **calabarica** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 400 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 385 (☿).

Type locality: Old Calabar, Southern Nigeria.

French Guinea: Kakoulima (F. Silvestri). French Congo: Brazzaville (A. Weiss).

22_2. Var. **ssibangensis** Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (☿).

Polyrhachis militaris var. *sibangensis* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 400 (☿, ♀).

Type locality: Sibange, French Congo (Soyaux).

French Congo: Brazzaville (A. Weiss).

22*a*. Subsp. **bruta** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 166 (♀).

Type locality: Belgian Congo.

22*b*. Subsp. **cupreopubescens** Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., (2) XVI, p. 120 (♀). Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿). Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (☿). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 154. Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 77 (☿); 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (☿). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 400 (☿). Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54 (♀). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 150 (☿, ♀); 1911, 'Wiss. Ergebn. Deutsch. Zentr. Afr. Exp. (1907–08),' III, p. 392 (☿). Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 372 (☿); 1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 180; 1913, Rev. Zool. Afr., II, p. 347 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 140 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 404 (☿). See p. 260.

Polyrhachis cupreopubescens Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 261.

Type locality: Africa; exact locality unknown.

Sierra Leone: Samlia Falls, River N'Gamie (Mocquerys). Ivory Coast: Assinie (C. Alluaud). Southern Nigeria: Old Calabar (Duke). Cameroon: Bibundi (Tessmann); Molundu (Schultze). Spanish Guinea: Eloby Island (H. Brauns). French Congo: Sibange (Soyaux); Ogowe (Mocquerys); Brazzaville (A. Weiss). Belgian Congo: Katanga (Lemaire); Kwesi to Kilo (Bayer); Avakubi (Schubotz); Medje; Avakubi (Lang and Chapin); Duma; Libenge (Schubotz). Uganda: Entebbe (Schultze). British East Africa: Taveta (Alluaud and Jeannel). German East Africa: Mt. Kilimanjaro (Bornemisza); Arusha-chini (Katona); Amani; Buiko (H. Prell; Zimmer); Usambara.

$22b_1$. Var. **dido** Wm. M. Wheeler, new name. See p. 261.

Polyrhachis militaris subsp. *cupreopubescens* var. *argentatus* Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 150 (☿) (*nec Polyrhachis argentatus* F. Smith, 1858).

Type locality: Bibundi, Cameroon (Zenker; Tessmann).

Liberia: Mt. Coffee (R. P. Currie). Cameroon: Longji (Paschen).

$22b_2$. Var. **epinotalis** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿).

Type locality: Elisabethville, Belgian Congo (Leplae).

$22b_3$. Var. **nkomoënsis** Forel, 1916, Rev. Suisse Zool., XXIV, p. 447 (☿, ♀, ♂). See p. 261.

Type locality: Belgian Congo (Kohl).

Belgian Congo: Akenge (Lang and Chapin).

$22b_4$. Var. **sankisiana** Forel, 1913, Rev. Zool. Afr., II, p. 348 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

$22b_5$. Var. **transversaria** Forel, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 77 (♀). See p. 261.

Type locality: Liberia (Hadler).

22*c*. Subsp. **striativentris** Emery, 1892, Ann. Soc. Ent. France, LX, (1891), p. 566 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 166 (♀).

Polyrhachis striativentris Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 270.

Type locality: Assinie, Ivory Coast (C. Alluaud).

Ivory Coast: (Lohier).

23. **Polyrhachis** (**Myrma**) **monista** Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 384, fig. 34 (☿). Forel, 1916, Rev. Suisse Zool., XXIV, p. 452 (☿, ♀).

Polyrhachis monista Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 398, fig. 20 (♀).

Type locality: French Congo.

Gold Coast: Aburi (F. Silvestri). Belgian Congo: Kilongalonga (Kohl).

24. **Polyrhachis** (**Myrma**) **natalensis** Santschi.

Polyrhachis natalensis Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 41 (☿).

Type locality: Stamford Hill, Natal (I. Trägårdh).

25. **Polyrhachis** (**Myrma**) **nigrita** Mayr. See p. 267.

Polyrhachis nigrita Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 153 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Chama, Gold Coast (H. Brauns).

Belgian Congo: Akenge (Lang and Chapin).

26. **Polyrhachis** (**Myrma**) **otleti** Forel, 1916, Rev. Suisse Zool., XXIV, p. 449 (☿, ♀, ♂).

Type locality: St. Gabriel, Belgian Congo (Kohl).

27. **Polyrhachis** (**Myrma**) **phidias** Forel.

Polyrhachis phidias Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 450 (☿).

Type locality: Equatorial Africa, exact locality unknown.

28. **Polyrhachis** (**Myrma**) **revoili** Ern. André. Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 262 (☿); 1916, Rev. Suisse Zool., XXIV, p. 452 (☿, ♀, ♂). See p. 267.

Polyrhachis revoili Ern. André, 1886, Rev. d'Ent. Caen, VI, pp. 285 and 287 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 268. Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 71 (☿). Ern. André, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿, ♀). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 153. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 778. Forel, 1913, Rev. Zool. Afr., II, p. 349 (☿, ♀).

Type locality: Somaliland (Revoil).

French Congo: Ogowe (Mocquerys). Belgian Congo: (Kohl); Kondué (Luja); Malela (J. Bequaert). Portuguese East Africa: Delagoa (Liengme). Natal: Durban (C. B. Cooper); Port Natal (H. Brauns).

28₁. Var. **conduensis** Forel, 1915, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 351 (☿).

Type locality: Kondué, Belgian Congo (Luja).

28₂. Var. **donisthorpei** Forel, 1916, Rev. Suisse Zool., XXIV, p. 453 (☿); 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 252 (☿).

Type locality: Northern Rhodesia.

28a. Subsp. **volkarti** Forel, 1916, Rev. Suisse Zool., XXIV, p. 453 (♀).

Type locality: Belgian Congo (Kohl).

29. **Polyrhachis (Myrma) rufipalpis** Santschi.

Polyrhachis rufipalpis Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 396 (☿).

Type locality: Brazzaville, French Congo (A. Weiss).

29a. Subsp. **mayumbensis** Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 358 (☿).

Type locality: Kiniati, Mayombe, Belgian Congo (R. Mayné).

30. **Polyrhachis (Myrma) schistacea** (Gerstæcker) Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 140 and 142 (☿).

Hoplomyrmus schistaceus Gerstæcker, 1858, Monatsb. Ak. Wiss. Berlin, p. 262 (☿).

Hoplomyrmus schistazeus Gerstæcker, in Peters, 1862, 'Reise n. Mossambique, Zool.,' V, p. 508 (☿), Pl. xxxii, fig. 6.

Polyrhachis schistazeus Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 446. Gerstæcker, 1871, Arch. f. Naturg., XXXVII, 1, p. 354; 1873, in 'v. d. Decken's Reisen in Ost-Afrika, Gliederthiere,' p. 342 (☿).

Polyrhachis militaris subsp. *schistacea* Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 288 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Polyrhachis schistacea Roger, 1863, 'Verzeich. Formicid.,' p. 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 268. Bingham, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 63 (☿). Dixey and Longstaff, 1907, Trans. Ent. Soc. London, pp. 344 and 355. Forel, 1907, Ann. Mus. Nat. Hungarici, V, p. 38 (♀); 1907, Mitth. Naturh. Mus. Hamburg, XXIV, p. 16 (♀); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿, ♀); 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 372 (☿); 1913, Rev. Zool. Afr., II, p. 348 (☿).

Polyrachis militaris var. *schistazea* H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38.

Type locality: Mozambique, Portuguese East Africa (Peters).

Portuguese Congo: Chinchoxo. Belgian Congo: Beni (Borgerhoff). British East Africa: Victoria Nyanza (Zimmer); Tiwi to Gazi (Alluaud and Jeannel); Mombasa (v. d. Decken); Fundu Island; Chake Chake, Pemba Island

(Voeltzkow). German East Africa: Mt. Kilimanjaro (Bornemisza); Barikiwa (Ch. Schroder); Tanga (Zimmer). Zanzibar: Mwera River; Bububu (Alluaud and Jeannel). Nyasaland: Fort Johnston (Rendall). Rhodesia: Matoppo Hills; Victoria Falls (Dixey and Longstaff). Transvaal: Pretoria (Distant).

30_1. Var. **divina** Forel, 1913, Rev. Zool. Afr., II, p. 348 (☿). Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 141 and 142 (☿). See p. 261.

Type locality: Pemba Island, British East Africa (Voeltzkow).

Belgian Congo: Zambi; Boma; Thysville; Poko (Lang and Chapin). British East Africa: Mombasa; Bura, Wa-Taita, 1050 m. (Alluaud and Jeannel). German East Africa: Darressalaam. Zanzibar.

30_2. Var. **gagatoides** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 314; 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 142 (☿).

Type locality: French Congo (A. Weiss).

30*a*. Subsp. **atrociliata** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 314 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 385 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 141 and 142 (☿). Stitz, 1916, 'Ergebn. Zweit. Deutsch. Zentr. Afr. Exp. 1910–11,' I, p. 404 (☿).

Type locality: Banzyville, Belgian Congo (Augustin).

French Guinea: Konakry (F. Silvestri). Uganda: Ibanda, Mt. Ruwenzori, 1400 m. (C. Alluaud). Belgian Congo: Duma (Schubotz). French Congo: Fort Crampel (Schubotz).

$30a_1$. Var. **benguelensis** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 314 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 141 and 142 (☿). See p. 261.

Type locality: Benguela (J. Cruchet).

Belgian Congo: Garamba; Yakuluku (Lang and Chapin).

30*b*. Subsp. **congolensis** (Santschi) Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿).

Polyrhachis schistacea var. *congolensis* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 399 (☿).

Polyrhachis gagates subsp. *congolensis* Forel, 1913, Rev. Zool. Afr., II, p. 282 (☿).

Polyrhachis (*Myrma*) *gagates* var. *congolensis* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 139 (☿).

Type locality: Mandouga, French Congo (A. Weiss).

French Congo: Comba Ibre (A. Weiss). Belgian Congo: Congo da Lemba (R. Mayné). British East Africa: Bura, Wa-Taita, 1050 m.; Voi (Alluaud and Jeannel).

30*c*. Subsp. **fracta** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 141 and 142 (☿).

Type locality: Fort Hall, 1330 m., British East Africa (Alluaud and Jeannel).

$30c_1$. Var. **subplana** Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 142 (☿).

Type locality: Gazi, British East Africa (Alluaud and Jeannel).

30*d*. Subsp. **medusa** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 206 (☿, ♀, ♂); 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 78.

Polyrhachis militaris subsp. *schistacea* var. *medusa* Emery, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 228.

Polyrhachis medusa Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿, ♀).

Polyrhachis (*Myrma*) *medusæ* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 140 (☿).

Type locality: Zanzibar (Voeltzkow).

German East Africa: Mafia Island (Voeltzkow); Lewa Mambaa (Stuhlmann). British East Africa: Ramisi River; Voi, Taita (Alluaud and Jeannel); Chake Chake, Pemba Island (Voeltzkow).

30*e*. Subsp. **nigriseta** (Santschi) Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357.

Polyrhachis nigriseta Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 399 (☿). Forel, 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 272 (☿).

Type locality: Mindouli, French Congo (A. Weiss).

Western Abyssinia: (Ilg).

30*e*₁. Var. **clariseta** (Santschi) Forel, 1913, Ann. Soc. Ent. Belgique, LVII, p. 357 (☿).

Polyrhachis nigriseta var. *clariseta* Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 400 (☿).

Polyrhachis (*Myrma*) *nigriseta* var. *clariseta* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 140 (☿).

Type locality: Mandouga, French Congo (A. Weiss).

Belgian Congo: Congo da Lemba (R. Mayné). British East Africa: Voi, Taita (Alluaud and Jeannel).

30*f*. Subsp. **rugulosa** (Mayr) Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿); 1910, Ann. Soc. Ent. Belgique, LIV, p. 450 (☿). Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 151 (☿). Forel, 1913, Ann. Soc. Ent. Belgique, LVII, pp. 147 (☿) and 357 (☿); 1913, Rev. Zool. Afr., II, p. 349 (☿); 1913, Deutsch. Ent. Zeitschr., Beih., p. 225 (☿).

Polyrhachis rugulosus Mayr, 1862, Verh. Zool. Bot. Ges. Wien, XII, p. 685 (☿), Pl. i, fig. 7. Roger, 1863, 'Verzeich. Formicid.,' p. 9. Emery, 1889, Bull. Soc. Ent. Italiana, XXI, p. 69, footnote. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 268. Emery, 1894, Mem. Accad. Sc. Bologna, (5) IV, p. 113 (♀). Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72. Emery, 1895, Ann. Soc. Ent. France, LXIV, p. 55 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 605 (☿, ♀, ♂). Santschi, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 400. Emery, 1912, Annuar. Mus. Zool. Univ. Napoli, N. S., III, No. 26, p. 2.

Polyrhachis carinatus F. Smith, 1858, Journ. Proc. Linn. Soc. London, Zool., II, p. 59; 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 71 (☿), Pl. iv, figs. 48 and 49 (*nec Formica carinata* Fabricius).

Polyrhachis militaris subsp. *cafrorum* Forel, 1879, Bull. Soc. Vaudoise Sc. Nat., XVI, p. 120 (☿, ♀, ♂); 1886, Ann. Soc. Ent. Belgique, XXX, p. 194 (☿). Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿).

Polyrhachis cafrorum Forel, 1892, Mitth. Schweiz. Ent. Ges., VIII, p. 350 (☿). Emery, 1892, Ann. Mus. Civ. Genova, XXXII, p. 122. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 260.

Polyrhachis militaris var. *rugulosa* Mayr, 1893, Jahrb. Hamburg. Wiss. Anst., X, 2, p. 197; 1895, Ann. Naturh. Hofmus. Wien, X, p. 154; in Sjöstedt, 1907, 'Exped. Kilimandjaro, Meru, etc.,' II, 8, p. 22.

Polyrachis militaris var. *rugulosa* H. Stadelmann, 1898, 'Deutsch-Ost-Afrika,' IV, Hym., p. 38.

Polyrhachis schistacea var. *rugulosa* Forel, 1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 372 (☿).

Polyrhachis (*Myrma*) *schistacea* var. *rugulosa* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' pp. 141 and 142 (☿); 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 385 (☿).

Type locality: Port Natal, Natal (not Brazil as originally given by Mayr).

Togo: Bismarckburg (Conradt). Cameroon: Etombe (Adametz). French Congo: Loango (H. Brauns); Brazzaville; Comba Ibre; Mandouga (A. Weiss). Portuguese Congo: Chinchoxo (Falkenstein). Belgian Congo: Kwesi to Kilo (Bayer); Kimpoko (Büttner); Old Kasongo (J. Bequaert); Congo da Lemba (R. Mayné); Boma (H. Brauns; Styczinski); Luapula River. Angola: Quifangondo (F. Silvestri). Rhodesia: (G. Arnold). Transvaal: Makapan; Hamman's Kraal (E. Simon); Valdezia (P. Berthoud). Cape Province: Kimberley (E. Simon). Portuguese East Africa: Delagoa (Liengme; A. Müller); Mozambique (Fornasini); Quilimane (Stuhlmann). German East Africa: Daressalaam (H. Brauns; A. Muller); Kibonoto, Kilimanjaro, 1000–3000 m.; Meru (Sjöstedt); Mafia Island (Voeltzkow). Zanzibar: (Stuhlmann). British East Africa: Kitui (Hildebrandt); Bura (H. Brauns); Mbuyuni, Pori, 1110 m. (Alluaud and Jeannel). Somaliland: (C. Keller); Magala Re Umberto (Ruspoli). Abyssinia: Webi (Bricchetti-Robecchi).

30f_1. Var. **divinoides** Forel, 1913, Rev. Zool. Afr., II, pp. 348 and 349 (☿). Bequaert, ibid., p. 431. See p. 261.

Polyrhachis (*Myrma*) *schistacea* var. *divinoides* Santschi, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 385 (☿); 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 142 (☿).

Type locality: Sankisia, Belgian Congo (J. Bequaert).

Belgian Congo: Boma (F. Silvestri); Banana (Lang and Chapin). Transvaal.

30g. Subsp. **schlüteri** Forel, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 72.

Polyrhachis militaris subsp. *schluteri* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 195 (☿). Ern. André, 1886, Rev. d'Ent. Caen, VI, p. 288 (☿). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 154 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777. Stitz, 1910, Mitt. Zool. Mus. Berlin, V, p. 151 (☿).

Polyrhachis schluteri Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 268.

Polyrhachis schistacea subsp. *schluteri* Santschi, 1914, Med. Göteborgs Mus. Zool. Afd., III, p. 42 (☿).

Polyrhachis (*Myrma*) *schluteri* Santschi, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 143 (☿).

Type locality: German East Africa (Schluter).

Togo: Bismarckburg (Conradt). Natal: Stamford Hill (I. Tragardh); Port Natal (H. Brauns). Zululand: Dukudu (I. Tragårdh). Portuguese East Africa: Delagoa (P. Berthoud; Liengme). British East Africa: Voi (C. Alluaud).

30g_1. Var. **indigens** (Forel).

Polyrhachis (*Myrma*) *schluteri* var. *indigens* Forel, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 261 (☿).

Type locality: Durban, Natal (G. Arnold).

30g_2. Var. **plebeia** (SANTSCHI).

Polyrhachis (Myrma) schluteri var. *plebeia* SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 143 (☿).

Type locality: Taveta, 750 m., BRITISH EAST AFRICA (Alluaud and Jeannel).

31. **Polyrhachis (Myrma) schoutedeni** SANTSCHI, 1919, Rev. Zool. Afr., VI, p. 249 (☿).

Type locality: Dolo, BELGIAN CONGO (F. Chaltin).

32. **Polyrhachis (Myrma) spinicola** FOREL.

Polyrhachis spinicola FOREL, 1894, Mitth. Schweiz. Ent. Ges., IX, p. 70 (☿, ♀). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Delagoa, PORTUGUESE EAST AFRICA (Junod).

PORTUGUESE EAST AFRICA: Muculla (A. Müller).

33. **Polyrhachis (Myrma) spitteleri** FOREL, 1916, Rev. Suisse Zool., XXIV p. 450, fig. 6 (☿).

Type locality: BELGIAN CONGO (Kohl).

34. **Polyrhachis (Myrma) sulcata** ERN. ANDRÉ.

Polyrhachis sulcata ERN. ANDRÉ, 1895, Rev. d'Ent. Caen, XIV, p. 1 (☿). MAYR, 1895, Ann. Naturh. Hofmus. Wien, X, p. 154 (♀). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777.

Type locality: Ogowe, FRENCH CONGO (Mocquerys).

CAMEROON: (H. Brauns). BELGIAN CONGO.

35. **Polyrhachis (Myrma) viscosa** F. SMITH. SANTSCHI, 1914, 'Voy. Alluaud et Jeannel Afr. Orient., Formicidæ,' p. 143 (☿, ♀). See p. 267.

Polyrhachis viscosus F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 71 (☿), Pl. IV, fig. 41. ROGER, 1863, 'Verzeich. Formicid.,' p. 6. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 447; 1886, ibid., XXXVI, p. 357. ERN. ANDRÉ, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 271. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 777; 1897, Ann. Mus. Civ. Genova, XXXVIII, p. 605 (☿, ♀); 1899, ibid., XXXIX, p. 501 (♀). FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿); 1910, Zool. Jahrb. Abt. Syst., XXIX, p. 272 (☿); 1913, Ann. Soc. Ent. Belgique, LVII, p. 143 (☿, ♀).

Polyrhachis antinorii EMERY, 1877, Ann. Mus. Civ. Genova, IX, p. 365, fig. (☿). ERN. ANDRÉ, 1887, Rev. d'Ent. Caen, VI, p. 287 (☿).

Type locality: Port Natal, NATAL.

SOUTHERN RHODESIA: Redbank (G. Arnold). GERMAN EAST AFRICA: Mafia Island (Voeltzkow). BRITISH EAST AFRICA: Voi, Taita; Bura, 1050 m. (Alluaud and Jeannel). SOMALILAND: Magala Re Umberto (Ruspoli). ABYSSINIA: Dimé to Bass Narok (V. Bottego); Coromma; Ganale (Ruspoli). ERITREA: Sciotel; Keren (Beccari); Ghinda (K. Escherich). BELGIAN CONGO: Ngayu (Lang and Chapin).

36. **Polyrhachis (Myrma) weissi** SANTSCHI.

Polyrhachis weissi SANTSCHI, 1910, Ann. Soc. Ent. France, LXXVIII, (1909), p. 395, fig. 18 (☿).

Type locality: Brazzaville, FRENCH CONGO (A. Weiss).

37. **Polyrhachis (Myrma) wellmani** FOREL.

Polyrhachis wellmani FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 68 (☿).

Type locality: BENGUELA (C. Wellman).

IX.—A SYNONYMIC LIST OF THE ANTS OF THE MALAGASY REGION

By Wm. M. Wheeler

The following list includes all the ants recorded from the Malagasy Region, viz. Madagascar, Nossi Bé, and the other islands of the Indian Ocean: Mauritius, Réunion, the Seychelles, the Comoros, Aldabra, Amirantes, Farquhar, Chagos, etc.

References contained in the foregoing catalogue of Ethiopian ants have not been repeated here.

FORMICIDÆ

CERAPACHYINÆ Forel

Cerapachyini Forel

Cerapachys F. Smith

1. **Cerapachys imerinensis** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 9.

Parasyscia imerinensis Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 138 (♀), Pl. III, fig. 12. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 17.

Type locality: Imerina, Madagascar (Camboué).

Phyracaces Emery

1. **Phyracaces kræpelini** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 11.

Cerapachys kræpelinii Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 246 (☿) and 488.

Type locality: Moramanga, Imerina, Madagascar (Sikora).

2. **Phyracaces mayri** (Forel) Emery, 1902, Rend. Accad. Sc. Bologna, N. S., VI, p. 24; 1911, 'Gen. Insect., Ponerinæ,' p. 11.

Cerapachys mayri Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 244 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 17. Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 264 (☿; *nec* ♂).

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Madagascar: Antongil Bay (Mocquerys).

2a. Var. **brachynodus** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 11.

Cerapachys mayri var. *brachynodus* Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 420 (☿).

Type locality: Madagascar (Sikora).

PONERINÆ Lepeletier

Cylindromyrmicini Emery

Simopone Forel

1. **Simopone emeryi** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 247 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 17. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 16.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

2. **Simopone grandidieri** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 141 (☿), Pl. iv, fig. 8. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 17. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 16.

Type locality: Imerina, Madagascar (Sikora).

3. **Simopone** (?) **mayri** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 16.

Cerapachys mayri Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 264 (♂; *nec* ☿; *nec* Forel).

Type locality: Antongil Bay, Madagascar (Mocquerys).

Amblyoponini Forel

Mystrium Roger

1. **Mystrium mysticum** Roger, 1862, Berlin. Ent. Zeitschr., VI, p. 247 (♀), Pl. i, figs. 15 and 15*a*–*b*; 1863, 'Verzeich. Formicid.,' p. 20. Mayr, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 436. Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 117 (♀), Pl. iii, fig. 11*b* (*nec* ♂; *nec* 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 520, ☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 15. Forel, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 304 (☿, ♀, ♂). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 265 (☿, ♀, ♂). Forel, 1904, Ann. Mus. Zool. Ac Sc. St. Pétersbourg, VIII, (1903), p. 369 (☿, ♀); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 75 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 23, Pl. i, figs. 12 and 12*b*.

Type locality: Madagascar.

Madagascar: Fénérive (Perrot); Fort Dauphin (Sikora); 30 miles northwest of Tamatave (O'Swald); Antongil Bay (Mocquerys). Comoros: Grand Comoro; Anjouan (Voeltzkow).

2. **Mystrium oberthüri** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 192 (☿). Wasmann, 1897, Zool. Anzeiger, XX, p. 250. Emery, 1900, Bull Soc. Ent. Italiana, XXXI, (1899), p. 267 (☿, ♂); 1911, 'Gen. Insect., Ponerinæ,' p. 23.

Type locality: Kalalo, Ile Sainte Marie, east coast of Madagascar (Perrot).

Madagascar: Antongil Bay (Mocquerys).

3. **Mystrium rogeri** Forel, 1899, Ann. Soc. Ent. Belgique, XLIII, p. 304 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 23.

Mystrium mysticum Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 117 (♂), Pl. iii, figs. 11 and 11*a* (*nec* ♀; *nec* Roger); 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 520 (☿).

Type locality: Imerina, Madagascar.

Madagascar: Amparafaravantsiv (Sikora).

4. **Mystrium stadelmanni** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 251 (☿); 1899, ibid., XLIII, p. 305. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 23.

Type locality: eastern Imerina, Madagascar (Sikora).

5. **Mystrium voeltzkowi** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 189, fig. 1 (☿, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 23.

Type locality: Nossi Bé (Voeltzkow).

5_1. ?Var. **fallax** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 192 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 23.

Type locality: Nossi Bé (Voeltzkow).

Platythyreini Emery

Platythyrea Roger

1. **Platythyrea arthuri** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 15 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29.

Type locality: Amber Mts., northern Madagascar.

2. **Platythyrea bicuspis** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 268 (☿, ♀); 1911, 'Gen. Insect., Ponerinæ,' p. 29.

Type locality: Antongil Bay, Madagascar (Mocquerys).

3. **Platythyrea mocquerysi** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 270 (☿, ♀). See p. 760.

Platythyrea mocquerisi Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 29.

Type locality: Antongil Bay, Madagascar (Mocquerys).

3a. Var. **debilior** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (☿).

Type locality: Tulear, southwest Madagascar (Voeltzkow).

Madagascar: north Mahafaly, southwest Madagascar (Voeltzkow).

4. **Platythyrea wroughtoni** Forel, 1900, Journ. Bombay Nat. Hist. Soc., XIII, p. 315 (☿). Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 75.

Type locality: Travancore, India.

4a. Subsp. **sechellensis** Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 159 (☿).

Type locality: Praslin, Seychelles (H. M. Scott).

Ponerini Forel

Bothroponera Mayr

1. **Bothroponera cambouei** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 133 (☿, ♀), Pl. iv, fig. 7. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 35.

Pachycondyla (Bothroponera) cambouei Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Type locality: Antananarivo, Imerina, Madagascar (Camboué).

2. **Bothroponera comorensis** (Ern. André) Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 129 (☿), Pl. iv, fig. 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36.

Ponera comorensis Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 292 (♀).

Pachycondyla (Bothroponera) comorensis Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45. Forel, 1907, Mitth. Naturh. Mus. Hamburg, XXIV, p. 14 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Type locality: Nossi Bé.

Madagascar: (Kiderlen).

3. **Bothroponera perroti** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 131 (☿), Pl. iv, fig. 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 36.

Ponera (Bothroponera) perroti Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 267 (☿).

Pachycondyla (Bothroponera) perroti Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Type locality: Fénérive, Madagascar (Perrot).

Madagascar: Antongil Bay (Mocquerys).

3a. Subsp. **admista** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 251 (☿); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188. Wasmann, 1897, Zool. Anzeiger, XX, p. 250.

Bothroponera admista Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 35.

Ponera (Bothroponera) perroti var. *admista* Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 267.

Pachycondyla (Bothroponera) perroti subsp. *admista* Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Madagascar: Antongil Bay (Mocquerys); Kalalo, Ile Sainte Marie (Perrot).

4. **Bothroponera wasmanni** Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 383 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 128 (☿), Pl. iv, fig. 4. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 37. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 188 and 196 (☿, ♀, ♂).

Ponera (Bothroponera) wasmanni Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 267 (♀).

Pachycondyla (Bothroponera) wasmanni Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 45; 1911, 'Gen. Insect., Ponerinæ,' p. 78.

Type locality: Nossi Bé (C. Keller; Voeltzkow).

Madagascar: Ile Sainte Marie (Perrot); Antongil Bay (Mocquerys); Diego Suarez (C. Alluaud).

Euponera Forel

Subgenus 1. **Euponera,** *sensu stricto*

1. **Euponera sikoræ** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 127 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 42. Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, Emery, 'Gen. Insect., Ponerinæ,' p. 83.

Type locality: Center of Madagascar (Sikora).

Subgenus 2. **Mesoponera** Emery

2. **Euponera (Mesoponera) elisæ** (Forel) Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 46; 1911, 'Gen. Insect., Ponerinæ,' p. 81. See p. 775.

Ponera elisæ Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 221 (☿), Pl. v, figs. 10 and 10a; 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 520 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 39.

Euponera (Xiphopelta) elisæ Forel, 1913, Deutsch. Ent. Zeitschr., Beih., p. 206.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: Amparafaravantsiv (Sikora).

3. **Euponera (Mesoponera) melanaria** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 81 (☿).

Ponera melanaria Emery, 1893, Ann. Soc. Ent. France, LXII, p. 260, footnote (☿).

Type locality: Ceylon (E. Simon).

India, Ceylon, Burma; a subspecies in Queensland.

3_1. Var. **macra** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 81 (☿).

Ponera melanaria var. *macra* Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 68 (☿). Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93.

Type locality: Mahé, Seychelles (C. Alluaud).

Subgenus 3. **Trachymesopus** Emery

4. **Euponera (Trachymesopus) darwini** (Forel). See p. 778.

Australia; a variety in India, Burma and Ceylon; and another in the Ethiopian Region.

4_1. Var. **madecassa** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 86.

Belonopelta darwini var. *madecassa* Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 268 (♀).

Type locality: Antongil Bay, Madagascar (Mocquerys).

Ponera Latreille

1. **Ponera indigens** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 246 and 487 (☿; originally given by error as ♀); Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Moramanga, Imerina, Madagascar (Sikora).

1_1. Var. **bellicosa** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 487 (☿, ♀, ♂). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Central Madagascar (Sikora).

2. **Ponera johannæ** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 220 (☿), Pl. v, fig. 11; 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 520 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 39. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 93 and 213. Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 68 (☿, ♀); 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336; 1901, ibid., XLV, p. 44. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: Amparafaravantsiv (Sikora); Diego Suarez (C. Alluaud). Seychelles: La Digue (C. Alluaud).

3. **Ponera ludovicæ** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 249 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 40. Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 44; 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

4. **Ponera punctatissima** Roger. See p. 782.

West Africa.

4*a*. Subsp. **indifferens** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 245 (☿, ♀). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Moramanga, Imerina, Madagascar (Sikora).

4*b*. Subsp. **jugata** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 251 (♀). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 258; 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Ponera jugata Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 39.

Type locality: Imerina Province, Madagascar (Sikora).

Madagascar: Antongil Bay (Mocquerys).

4b. Var. **glabrata** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 245 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 91.

Type locality: Moramanga, Imerina, Madagascar (Sikora).

5. **Ponera ragusæ** Emery. See p. 782.

Ponera ragusai Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 159 (☿).

Seychelles: Mahé (H. M. Scott).

6. **Ponera sakalava** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 124 (♀), Pl. iv, fig. 3; ibid., p. 222 (☿), Pl. v, fig. 9. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 42. Emery, 1901, Ann. Soc. Ent. Belgique, XLV, p. 44; 1911, 'Gen. Insect., Ponerinæ,' p. 92.

Type locality: Center of Madagascar (Hildebrandt).

Madagascar: Andrangoloaka Forest (Sikora).

6a. Subsp. **excelsior** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 248 (☿).

Ponera excelsior Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 39.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Leptogenyini Forel

Leptogenys Roger

Subgenus 1. **Leptogenys,** *sensu stricto*

1. **Leptogenys alluaudi** Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 338 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 99.

Type locality: Diego Suarez, northern Madagascar (C. Alluaud).

2. **Leptogenys comorensis** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99.

Type locality: Moheli, Comoros (Voeltzkow).

Madagascar: Lake Alaotra (Voeltzkow).

3. **Leptogenys falcigera** Roger, 1861, Berlin. Ent. Zeitschr., V, p. 42 (☿); 1862, ibid., VI, p. 244 (☿, ♂), Pl. i, fig. 14. Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 109 (☿, ♂), Pl. iii, fig. 10. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 46. Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 271. Forel, 1900, Journ. Bombay Nat. Hist. Soc., XIII, pp. 304 and 309. Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 53, fig. 30 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99.

Type locality: Ceylon (Nietner).

Indomalayan Region.

Madagascar: Tamatave (Camboué); Ivondrona River near Tamatave (C. Keller); Antongil Bay (Mocquerys).

4. **Leptogenys gracilis** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 271 (☿). Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 99.

Type locality: Antongil Bay, Madagascar (Mocquerys).

Madagascar: Tamatave (Voeltzkow).

5. **Leptogenys incisa** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 113 (☿), Pl. iv, fig. 1. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 46. Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Type locality: Mt. Lokobé, Nossi Bé (O'Swald).

5₁. Var **imerinensis** FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 242 (☿, ♂). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 46.

Leptogenys incisa subsp. *imerinensis* EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

5a. Subsp. **suarensis** EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 338 (☿); 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Type locality: Diego Suarez, MADAGASCAR (C. Alluaud).

6. **Leptogenys maxillosa** (F. SMITH) MAYR, 1886, Verh. Zool. Bot. Ges. Wien, XXXVI, p. 358. FOREL, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 112 (☿, ♂). FOREL, 1897, Abh. Senckenberg. Naturf. Ges., XXI, p. 185 (☿); 1907, Trans. Linn. Soc. London, Zool., XII, p. 91. See p. 787.

Type locality: MAURITIUS (Beke).

MADAGASCAR: Ivondrona (C. Keller). NOSSI BÉ: (Voeltzkow). SEYCHELLES: (Eagle). AMIRANTES: (Eagle). COETIVY: (J. S. Gardiner).

6₁. Var. **vinsonnella** (DUFOUR) EMERY, 1894, Ann. Soc. Ent. France, LXIII, p. 68 (☿). FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 99. FOREL, 1912, Trans. Linn. Soc. London, Zool., XV, p. 159 (☿).

Formica vinsonnella L. DUFOUR, 1864, Ann. Soc. Ent. France, (4) IV, p. 210 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 214.

Type locality: RÉUNION (Vinson).

SEYCHELLES: (A. Brauer); Mahé (C. Alluaud); Dennis Island (H. M. Scott). COMOROS: Moheli (Voeltzkow). MADAGASCAR: Ile Sainte Marie (Voeltzkow).

7. **Leptogenys voeltzkowi** FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 194 (☿). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Type locality: NOSSI BÉ (Voeltzkow).

Subgenus 2. **Machærogenys** EMERY

Leptogenys subg. *Machærogenys* EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Subgenotype: *Leptogenys truncatirostris* Forel, 1897.

8. **Leptogenys (Machærogenys) antongilensis** EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Leptogenys incisa var. *antongilensis* EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 272, fig. (☿).

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

9. **Leptogenys (Machærogenys) ridens** FOREL. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 100.

Leptogenys ridens FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 16 (☿).

Type locality: Fort Dauphin, MADAGASCAR (Sikora).

10. **Leptogenys (Machærogenys) truncatirostris** FOREL. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 101, Pl. III, fig. 11.

Leptogenys truncatirostris FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 195, fig. 2 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 389 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 76 (♂?).

Type locality: Nossi Bé (Voeltzkow).

Madagascar: Ranomafana; Fort Dauphin (Sikora). Comoros: Anjouan; Grand Comoro (Voeltzkow).

Subgenus 3. **Lobopelta** (Mayr)

11. **Leptogenys (Lobopelta) angusta** (Forel) Emery, 1911, 'Gen. Insect. Ponerinæ,' p. 101.

Lobopelta angusta Forel, 1892, Ann. Soc. Ent Belgique, XXXVI, p. 519 (☿).,

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

12. **Leptogenys (Lobopelta) cœrulescens** Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102.

Leptogenys cærulescens Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 339 (☿).

Type locality: Diego Suarez, northern Madagascar (C. Alluaud).

13. **Leptogenys (Lobopelta) grandidieri** Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 17 (☿). Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102.

Type locality: Fort Dauphin, Madagascar (Sikora).

14. **Leptogenys (Lobopelta) jonesi** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102.

Lobopelta jonesii ? Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 219 (♂).

Lobopelta jonesii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 45.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

15. **Leptogenys (Lobopelta) o'swaldi** (Forel) Emery, 1911; 'Gen. Insect., Ponerinæ,' p. 102.

Lobopelta o'swaldi Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 119 (☿), Pl. iv, fig. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 45.

Type locality: 30 miles northwest of Tamatave, Madagascar (O'Swald).

16. **Leptogenys (Lobopelta) saussurei** (Forel) Emery, 1911, 'Gen. Insect., Ponerinæ,' p. 102.

Lobopelta saussurei Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 121 (☿) and p. 218 (♂?). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 45.

Type locality: Mahanoro, east coast of Madagascar.

Madagascar: Andrangoloaka Forest (Sikora).

16a. Subsp. **acutirostris** Santschi, 1912, Ann. Soc. Ent. Belgique, LVI, p. 150 (☿).

Type locality: Madagascar.

Odontomachini Mayr

Anochetus Mayr

1. **Anochetus africanus** (Mayr). See p. 790.

1_1. Var. **friederichsi** Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (♀).

Type locality: Ilot Prune near Tamatave, Madagascar (Friederichs).

1_2. Var. **madagascarensis** Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 47. Emery, 1911, 'Gen. Insect. Ponerinæ,' p. 108.

Anochetus africanus var. *madagascariensis* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 107 (☿), Pl. III, fig. 8; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 185 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 369 (♀); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 75 (☿).

Type locality: Nossi Bé (C. Keller; Voeltzkow).

MADAGASCAR: near Tamatave (C. Keller); southern part (Sikora); Andranohinaly (Voeltzkow).

2. **Anochetus grandidieri** FOREL, in Grandidier, 1891, 'Hist Phys. Nat. Madagascar,' XX, 2, p. 108 (☿), Pl. III, fig. 9. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 48. EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 109. See p. 791.

Type locality: Forests of the eastern coast of MADAGASCAR (Humblot).

Champsomyrmex EMERY

Champsomyrmex EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 558, footnote; 1911, 'Gen. Insect., Ponerinæ,' p. 111.

Odontomachus (part) ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 30. FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 103.

Stenomyrmex (part) MAYR, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 63.

Genotype: *Odontomachus coquereli* Roger, 1861.

1. **Champsomyrmex coquereli** (ROGER) EMERY, 1892, Ann. Soc. Ent. France, LX, (1891), p. 558. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 49. WASMANN, 1897, Zool. Anzeiger, XX, pp. 250 and 251 (♀). EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 111.

Odontomachus coquereli ROGER, 1861, Berlin. Ent. Zeitschr., V, p. 30 (☿); 1863, 'Verzeich. Formicid.,' p. 21. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 436. FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 105 (☿), Pl. III, fig. 7; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188.

Stenomyrmex coquereli MAYR, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 63, footnote.

Type locality: MADAGASCAR (Coquerel).

MADAGASCAR: Kalalo, Ile Sainte Marie (Perrot).

1a. Subsp. **minor** EMERY, 1911, 'Gen. Insect., Ponerinæ,' p. 111.

Champsomyrmex coquereli var. *minor* EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 273 (☿).

Odontomachus (*Champsomyrmex*) *coquereli* var. *minor* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 75.

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

MADAGASCAR: Lake Alaotra (Voeltzkow).

Odontomachus LATREILLE

1. **Odontomachus hæmatoda** (LINNÆUS). See p. 794.

Odontomachus hæmatodes ERN. ANDRÉ, 1887, Rev. d'Ent. Caen, VI, p. 290 (☿, ♂). FOREL, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 104 (☿, ♀, ♂); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188. WASMANN, 1897, Zool. Anzeiger, XX, p. 250. FOREL, 1909, Ann. Soc. Ent. Belgique, LIII, p. 54; 1912, Trans. Linn. Soc. London, Zool., XV, p. 159 (☿); 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (♂).

Madagascar: (Humblot); Ivondrona near Tamatave (C. Keller; Camboué); Ilot Prune near Tamatave; Diego Suarez (Friederichs); Kalalo, Ile Sainte Marie (Perrot). Seychelles: Mahé (H. M. Scott).

PSEUDOMYRMINÆ Emery

Pseudomyrmini Emery

Tetraponera F. Smith

1. **Tetraponera arrogans** (Santschi).

Sima arrogans Santschi, 1911, Rev. Suisse Zool., XIX, p. 117 (♀).

Type locality: Morondava, Madagascar (Grandidier).

2. **Tetraponera demens** (Santschi).

Sima demens Santschi, 1911, Ann. Soc. Ent. Belgique, LV, p. 282 (☿).

Type locality: Andridana, banc d'Ampasiondacra, Madagascar (Joly).

3. **Tetraponera diana** (Santschi).

Sima diana Santschi, 1911, Rev. Suisse Zool., XIX, p. 119, fig. 1 (♀).

Type locality: Tanala Forest, region Ikongo, Ankarimbelo, Madagascar (C. Alluaud).

4. **Tetraponera exasciata** (Forel).

Sima exasciata Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 261 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 54.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

5. **Tetraponera fictrix** (Forel).

Sima fictrix Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 198 (♀).

Type locality: Nossi Bé (Voeltzkow).

6. **Tetraponera flexuosa** (Santschi).

Sima flexuosa Santschi, 1911, Rev. Suisse Zool., XIX, p. 120 (☿).

Type locality: Madagascar.

Madagascar: Vohemar (Grandidier); Baly Bay (Joly).

7. **Tetraponera grandidieri** (Forel).

Sima grandidieri Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 203 (☿) and 229 (♀, ♂); 1892, ibid., p. 260, Pl. v, fig. 3. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 54. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 336 and 339 (☿); 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 273.

Type locality: Central Madagascar (Hildebrandt).

Madagascar: Imerina; Anosibé (Sikora); Antongil Bay (Mocquerys); Diego Suarez (C. Alluaud).

7_1. Var. **hildebrandti** (Forel).

Sima grandidieri var. *hildebrandti* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 204 (☿); 1892, ibid., p. 260.

Sima hildebrandti Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 54.

Type locality: Betsileo, Madagascar (Hildebrandt).

Madagascar: Anosibé (Sikora).

7_2. Var. **variegata** (Forel).

Sima grandidieri var. *variegata* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 487 (☿).

Type locality: Central Madagascar (Sikora).

8. **Tetraponera hysterica** (Forel).

Sima hysterica Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 258 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 54. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 77 (☿).

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Madagascar: Andranohinaly; Tulear; Lake Alaotra (Voeltzkow).

8. Var. **inflata** (Forel).

Sima sahlbergi var. *inflata* Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 273 (☿).

Sima hysterica var. *inflata* Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 376.

Type locality: Antongil Bay, Madagascar (Mocquerys).

8a. Subsp. **dimidiata** (Forel).

Sima hysterica subsp. *dimidiata* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 487 (☿).

Type locality: Central Madagascar (Sikora).

9. **Tetraponera mandibularis** (Emery).

Sima mandibularis Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 340, fig. 1 (♀).

Type locality: Diego Suarez, Madagascar (C. Alluaud).

10. **Tetraponera rakotonis** (Forel).

Sima rakotonis Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 206 (☿), Pl. v, fig. 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 55.

Type locality: Morondava, western Madagascar (Grevé).

11. **Tetraponera rufonigra** (Jerdon) F. Smith, 1877, Trans. Ent. Soc. London, p. 68.

Eciton rufonigrum Jerdon, 1851, Madras Journ. Litt. Sc., XVII, p. 111; 1854, Ann. Mag. Nat. Hist., (2) XIII, p. 53 (☿).

Pseudomyrma rufonigra F. Smith, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 159. Horne, 1872, Science Gossip, No. 89, p. 109. Moggridge, 1873, 'Harvesting Ants,' p. 67.

Sima rufonigra Mayr, 1867, Tijdschr. v. Ent., X, p. 114 (☿). F. Smith, 1873, Trans. Ent. Soc. London, Proc., p. ix. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 5. Forel, 1903, Journ. Bombay Nat. Hist. Soc., XIV, p. 708 (☿). Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 108 (☿, ♀). Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (☿, ♀).

Pseudomyrma bicolor F. Smith, 1875, Trans. Ent. Soc. London, p. 35 (☿), Pl. i, fig. 4. Rothney, 1889, ibid., p. 352.

Formica rufonigra H. L. Roth, 1885, Journ. Linn. Soc. London, Zool., XVIII, p. 327.

Type locality: Carnatic, India (Jerdon).

India, Nicobares. Seychelles: Silhouette, apparently introduced (H. M. Scott).

12. **Tetraponera sahlbergi** (Forel).

Sima sahlbergi Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 386 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 204 (☿, ♀), Pl. v, fig. 4; 1892, ibid., p. 260. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 55.

Sima sahlbergi EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 337 and 340 (☿).

Type locality: Ivondrona River near Tamatave, MADAGASCAR (C. Keller).

MADAGASCAR: Imerina Province (Sikora). NOSSI BÉ (C. Alluaud).

12_1. Var. **longula** (EMERY).

Sima sahlbergi var. *longula* EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 340 (☿).

Type locality: Diego Suarez, MADAGASCAR (C. Alluaud).

12*a*. Subsp. **deplanata** (FOREL).

Sima sahlbergi subsp. *deplanata* FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 375 (☿).

Type locality: Fort Dauphin, southern MADAGASCAR (Sikora).

12*b*. Subsp. **morondaviensis** (FOREL).

Sima sahlbergii subsp. *morondaviensis* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 206 (☿); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿).

Sima morondaviensis DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 54.

Type locality: Morondava, western MADAGASCAR (Grevé).

MADAGASCAR: Majunga (Voeltzkow).

12*c*. Subsp. **spuria** (FOREL).

Sima sahlbergi subsp. *spuria* FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 199 (☿, ♂); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 77 (☿, ♀).

Type locality: NOSSI BÉ (Voeltzkow).

MADAGASCAR: Ile Sainte Marie; Tulear (Voeltzkow).

MYRMICINÆ Lepeletier

Pheidolini Emery

Aphænogaster MAYR

Aphænogaster MAYR, 1853, Verh. Zool. Bot. Ges. Wien, III, p. 107.

Genotype: *Aphænogaster sardous* Mayr, 1853.

Subgenus 1. Aphænogaster, *sensu stricto*

Aphænogaster subg. *Attomyrma* EMERY, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914-15), p. 70 (type: *Formica subterranea* Latreille).

Subgenotype: same as genotype.

1. **Aphænogaster friederichsi** FOREL, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 151 (☿).

Type locality: Diego Suarez, MADAGASCAR (Friederichs).

Subgenus 2. Deromyrma FOREL

Aphænogaster subg. *Deromyrma* FOREL, 1913, Rev. Zool. Afr., II, p. 350.

Subgenotype: *Aphænogaster swammerdami* Forel, 1886.

2. **Aphænogaster (Deromyrma) gonacantha** EMERY, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914-15), p. 71.

Ischnomyrmex gonacantha EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 277, fig. (☿).

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

3. **Aphænogaster (Deromyrma) swammerdami** Forel, 1913, Rev. Zool. Afric., II, p. 350. Emery, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914–15), p. 71.

Aphænogaster (Ischnomyrmex) swammerdami Forel, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. cvi (☿). Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 117; 1896, Notes Leyden Mus., XVIII, p. 76; 1911, Tijdschr. v. Ent., LIV, p. 201.

Aphænogaster swammerdami Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿). Emery, 1888, Ann. Mus. Civ. Genova, XXV, p. 532, footnote (☿), Pl. ix, fig. 5. Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 167 (☿, ♀, ♂), Pl. iv, fig. 14. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 107.

Stenamma (Ischnomyrmex) swammerdami Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿). Wasmann, 1904, Notes Leyden Mus., XXV, p. 44. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 83 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿).

Ischnomyrmex swammerdami Wasmann, 1911, 1er Congr. Intern. Entom. Bruxelles (1910), II, Mém., p. 224; 1913, Ann. Rept. Smiths. Inst. for 1912, p. 467; Tijdschr. v. Ent., LX, (1917), p. 397.

Type locality: Madagascar (Grandidier).

Madagascar: (Kiderlen); Ivondrona near Tamatave (C. Keller); Majunga, western part; Kinkuni Region, northwestern part; Tulear; Andranohinaly; Tsimanampetsotsy, southwestern part (Voeltzkow); Antananarivo (Camboué); Thosy in the Bara country (Besson). Nossi Bé: (C. Keller; Voeltzkow).

3_1. Var. **clara** (Santschi).

Deromyrma swammerdami var. *clara* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 250 (☿).

Type locality: Baly Bay, Madagascar (Joly).

3_2. Var. **curta** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 169 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 107.

Type locality: Morondava, western Madagascar (Grevé).

3_3. Var. **spinipes** (Santschi).

Aphænogaster (Ichnomyrmex) schwammerdami var. *spinipes* Santschi, 1911, Rev. Suisse Zool., XIX, p. 123 (☿).

Type locality: Ankavandro Province, Madagascar (J. Huré).

Pheidole Westwood

All the Malagasy species belong to the subgenus *Pheidole*, *sensu stricto*.

1. **Pheidole annemariæ** Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 152 (♃, ☿, ♀).

Type locality: Ilot Prune near Tamatave, Madagascar (Friederichs).

2. **Pheidole bessoni** (Forel) Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 88; Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 162 (♃, ☿).

Pheidole o'swaldi subsp. *bessonii* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 176 (☿) and 227 (♃, ☿).

Type locality: Fianarantsoa, Madagascar (Besson; Gietlen).

3. **Pheidole braueri** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 204 (♃, ☿, ♀).

Type locality: Seychelles (A. Brauer).

4. **Pheidole ensifera** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 197 (♃, ☿).

Type locality: Nossi Bé (Voeltzkow).

5. **Pheidole flavens** Roger, 1863, Berlin. Ent. Zeitschr., VII, p. 198 (♃, ☿).

Type locality: Cuba.

5_1. Var. **farquharensis** Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 91 (☿).

Type locality: Farquhar Island (J. S. Gardiner).

6. **Pheidole grallatrix** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 278 (♃, ☿).

Type locality: Antongil Bay, Madagascar (Mocquerys).

7. **Pheidole jonas** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 82 (♃, ☿).

Type locality: Grand Comoro (Voeltzkow).

8. **Pheidole longispinosa** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 170 (♃, ☿, ♀), Pl. v, fig. 1. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 92.

Type locality: Antananarivo, Imerina, Madagascar (Sikora; Camboué).

8a. Subsp. **scabrata** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 249 (♃, ☿).

Type locality: eastern Imerina, Madagascar (Sikora).

9. **Pheidole lucida** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 248 (☿).

Type locality: Andrangoloaka, Madagascar (Sikora).

10. **Pheidole madecassa** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 525 (♃, ☿).

Type locality: Amparafaravantsiv, Madagascar (Sikora).

11. **Pheidole megacephala** (Fabricius) Forel, 1887, Mitt. Schweiz. Ent. Ges., VII, p. 382 (♃, ☿, ♀); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 176 (♃, ☿, ♀, ♂); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 185 (♃, ☿, ♀, ♂). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 280. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 91; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (☿). See p. 812.

Madagascar: Ivondrona (C. Keller); Majunga (Voeltzkow); Ambohipo near Antananarivo (Camboué); Antongil Bay (Mocquerys). Nossi Bé: (Voeltzkow). Réunion: St. Denis (C. Keller). Amirantes: (J. S. Gardiner). Farquhar: (J. S. Gardiner). Island Desroches: (J. S. Gardiner). Coetivy: (J. S. Gardiner). Comoros: Mayotte; Anjouan (Voeltzkow).

11_1. Var. **scabrior** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 178 (♃, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 93. Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71. Wasmann, 1897, Zool. Anzeiger, XX, p. 250.

Pheidole megacephala subsp. *scabrior* Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 188; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (♃, ☿, ♀, ♂).

Pheidole megacephala subsp. *pusilla* var. *scabrior* Emery, 1916, Rev. Zool. Afr., IV, pp. 235 and 240 (♃).

Type locality: Madagascar.

Madagascar: Kalalo in the Ile Sainte Marie (Perrot). Nossi Bé: (Voeltzkow). Seychelles: Mahé; Praslin; La Digue; Marie-Anne; Ile Ronde (C. Alluaud). Comoros: Anjouan (Voeltzkow).

11$_2$. Var. **spinosa** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 178 (♃, ☿).

Pheidole megacephala subsp. *spinosa* Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186; 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 373 (♃, ☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (♃, ☿); 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (☿, ♂).

Pheidole megacephala subsp. *pusilla* var. *spinosa* Emery, 1916, Rev. Zool. Afr., IV, pp. 235 and 240, fig. 1*b* (♃); 1919, ibid., VI, p. 170, fig. 5*b* (☿).

Type locality: Antananarivo, Madagascar.

Madagascar: Fianarantsoa; Ile aux Prunes near Tamatave; Diego Suarez (Friederichs); Ranomafana, southern part (Sikora). Nossi Bé: (Voeltzkow).

11a. Subsp. **punctulata** (Mayr) Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 185 and 187. See p. 815.

Pheidole megacephala var. *punctulata* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, p. 227.

Pheidole punctulata Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (♃, ☿, ♀, ♂); 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (♃, ☿, ♀, ♂).

Madagascar: (Voeltzkow); Imerina (Sikora). Nossi Bé: (Voeltzkow). Aldabra Islands: (Voeltzkow; Fryer). Comoros: Anjouan; Grand Comoro (Voeltzkow). Seychelles: Silhouette; Mahé; Bird Island (Fryer).

12. **Pheidole nemoralis** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 526 (♃, ☿). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 280.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: Antongil Bay (Mocquerys).

12$_1$. Var. **petax** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 488 (♃, ☿).

Type locality: Central Madagascar (Sikora).

13. **Pheidole o'swaldi** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 173 and 227 (♃, ☿, ♀, ♂), Pl. v, fig. 2. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 94. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 278.

Type locality: 30 miles northwest of Tamatave, Madagascar (O'Swald).

Madagascar: Imerina (Sikora); Antongil Bay (Mocquerys); Diego Suarez (C. Alluaud).

13a. Subsp. **decollata** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 527 (♃, ☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

14. **Pheidole picata** Forel. Emery, 1916, Rev. Zool. Afr., IV, p. 245, fig. 8*b* (♃, ☿). Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (☿). See p. 818.

Pheidole megacephala var. *picata* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 178 (♃, ☿); 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228. Emery, 1895, ibid., XXXIX, pp. 336 and 337. E. Bordage, 1914, Bull. Scientif. France et Belgique, XLVII, (1913), p. 389.

Pheidole megacephala subsp. *picata* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49; 1905, ibid., XLIX, p. 163.

Pheidole punctulata subsp. *picata* Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186, 187, and 188; 1905, Ann. Soc. Ent. Belgique, XLIX, p. 163; in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (♃, ☿, ♀, ♂); 1907, Trans. Linn. Soc. London, Zool., XII, p. 91; 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (♃, ☿).

Type locality: Antananarivo, Madagascar.

Madagascar: Diego-Suarez (C. Alluaud); Ile aux Prunes (Friederichs); Fianarantsoa (Gietlen); Majunga; Fénérive, eastern part; Tsimanampetsotsy, southwestern part; Ile Sainte Marie (Voeltzkow). Nossi Bé: (C. Alluaud; Voeltzkow). Réunion: (C. Alluaud; J. de Cordemoy; E. Bordage). Mauritius: (A. Voeltzkow). Seychelles: (A. Brauer). Aldabra Islands: (Voeltzkow). Cargados Islands: Siren Island (J. S. Gardiner). Juan de Nova Island in the Strait of Mozambique: (A. Voeltzkow).

Typical of the Malagasy Region and, according to Forel, not on the African continent. Santschi alone records it from the French Congo.

14_1. Var. **bernhardæ** (Forel) Emery, 1916, Rev. Zool. Afr., VI, p. 245, figs. 8a and *d* (♃, ☿).

Pheidole punctulata subsp. *spinosa* var. *bernhardæ* Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 164 (♃, ☿).

Type locality: Fianarantsoa, Madagascar (Gietlen).

14_2. Var. **gietleni** (Forel) Emery, 1916, Rev. Zool. Afr., VI, p. 245, figs. 8c and *e* (♃, ☿).

Pheidole punctulata subsp. *gietleni* Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 164 (♃, ☿); 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 240 (♃, ☿).

Type locality: Fianarantsoa, Madagascar (Gietlen).

Madagascar: (R. Beck).

15. **Pheidole sikoræ** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 223 (♃, ☿); 1892, ibid., p. 258 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 96.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

15_1. Var. **litigiosa** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 526 (♃, ☿, ♀).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

16. **Pheidole veteratrix** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 225 (♃, ☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 97.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

16_1. Var. **angustinoda** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 526 (♃, ☿).

Type locality: Amparafaravantsiv, Madagascar (Sikora).

17. **Pheidole voeltzkowi** Forel, 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 227 (♃, ☿, ♂).

Pheidole voeltzkowi Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 187 and 207 (♃, ☿, ♂).

Type locality: Majunga, western Madagascar (Voeltzkow).

Aldabra Islands: (Voeltzkow).

Parapheidole Emery

Parapheidole Emery, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914–15), p. 68.

Genotype: *Aphaenogaster oculata* Emery, 1900.

1. **Parapheidole oculata** Emery, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914–15), p. 68, fig. A (♀).

Aphaenogaster oculata Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 276 (♀).

Type locality: Antongil Bay, Madagascar (Mocquerys).

Melissotarsini Emery

Melissotarsus Emery

1. **Melissotarsus insularis** Santschi, 1911, Rev. Suisse Zool., XIX, p. 122, fig. 2 (☿, ♂).

Type locality: Makaraingo, Madagascar (Escoffre).

Cardiocondylini Emery

Cardiocondyla Emery

1. **Cardiocondyla cristata** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 306.

Monomorium cristatum Santschi, 1912, ibid., LVI, p. 163, fig. D (☿).

Type locality: Baly Bay, Madagascar (Joly).

2. **Cardiocondyla emeryi** Forel. Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 69 (☿). Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93; 1912, ibid., XV, p. 163 (♂). See p. 827.

Seychelles: Mahé (C. Alluaud); Anonyme Island (H. M. Scott).

2a. Var. **rasalamae** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 161 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 71.

Cardiocondyla emeryi subsp. *rasalamae* (?) Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 163 (♀).

Type locality: Antananarivo, Imerina, Madagascar (Camboué).

Seychelles: Silhouette, 1500 ft.; Mahé, 1000 ft. (H. M. Scott).

3. **Cardiocondyla nuda** (Mayr) Forel, 1881, Mitth. Munchen. Ent. Ver., V, p. 3 (☿).

Leptothorax nudus Mayr, 1866, Sitzb. Ak. Wiss. Wien, math. naturw. Kl., LIII, Abt. 1, p. 508 (☿).

Type locality: Ovalau, Fiji Islands.

Oceania, India; a variety in Tunis.

3a. Var. **shuckardoides** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 250 (☿).

Type locality: Antananarivo, Madagascar (Sikora).

4. **Cardiocondyla shuckardi** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 161 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 71.

Type locality: Antananarivo, Madagascar (Camboué).

4a. Subsp. **sculptinodis** Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 305 (♀).

Type locality: Madagascar.

Crematogastrini Emery

Crematogaster Lund

Subgenus 1. **Crematogaster,** *sensu stricto*

1. **Crematogaster adrepens** (Forel).

Cremastogaster adrepens Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 197 (☿).

Type locality: Nossi Bé (Voeltzkow).

2. **Crematogaster ægyptiaca** (Mayr). See p. 828.

2*a*. Subsp. **senegalensis** (Roger). See p. 828.

Cremastogaster senegalensis Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 193 (☿, ♀).

Madagascar: (*teste* André).

3. **Crematogaster castanea** F. Smith. See p. 830.

Cremastogaster tricolor Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 388 (☿, ♀, ♂); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 187 (☿, ♀, ♂), Pl. vi, figs. 5, 5*a*, 5*b*; 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 80 (☿).

Crematogaster tricolor Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336.

Cremastogaster tricolor var. *decolor* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 188 (☿).

Cremastogaster tricolor var. *castanea* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 80.

Madagascar: Vohemar; Tamatave (C. Keller); Morondava (Grevé); Soanierana; Majunga (Voeltzkow); Diego Suarez (C. Alluaud). Comoros: Mayotte (Voeltzkow).

4. **Crematogaster degeeri** (Forel) Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336.

Cremastogaster degeeri Forel, 1886, ibid., XXX, C. R., p. cvii (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 189 (☿, ♀, ♂), Pl. vi, fig. 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 81. Santschi, 1912, Bull. Soc. Ent. France, p. 411 (☿).

Type locality: Imerina, Madagascar (Grandidier).

Madagascar: Ambohipo; Antananarivo (Camboué); Diego Suarez (C. Alluaud;) Fianarantsoa, Betsileo Country (Besson).

5. **Crematogaster gibba** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 70, fig. (☿).

Cremastogaster gibba Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿, ♀, ♂); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿); 1907, Trans. Linn. Soc. London, Zool., XII, p. 93; 1909, Ann. Soc. Ent. Belgique, LIII, p. 54; 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (♀).

Type locality: Praslin, Seychelles (C. Alluaud).

Seychelles: (A. Brauer); Mahé (H. M. Scott).

6. **Crematogaster kelleri** (Forel).

Cremastogaster kelleri Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 197 (☿), Pl. vi, fig. 10. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 82.

Type locality: Ivondrona near Tamatave, Madagascar (C. Keller).

7. **Crematogaster madagascariensis** (Ern. André).

Cremastogaster madagascariensis Ern. André, 1887, Rev. d'Ent. Caen, VI, p. 297 (☿, ♀, ♂). Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 191 (☿, ♀, ♂), Pl. vi, fig. 7; 1892, ibid., p. 254. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 83. Forel, 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (♀, ♂).

Type locality: Tamatave, Madagascar.

Madagascar: Ile aux Prunes near Tamatave; Diego Suarez (Friederichs); Andrangoloaka (Sikora); central region (Humblot).

8. **Crematogaster pacifica** Santschi, 1919, Rev. Zool. Afr., VI, p. 236 (☿).

Type locality: Madagascar.

9. **Crematogaster rasoherinæ** (Forel).

Cremastogaster rasoherinæ Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 194 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 85. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 79 (☿, ♀); 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (☿, ♀, ♂).

Type locality: Tamatave, Madagascar (O'Swald).

Madagascar: Tamatave; Ile Sainte Marie (Voeltzkow). Seychelles: Mahé, 1000 ft.; Silhouette, Pointe Etienne and Mare aux Cochons (H. M. Scott).

9_1. Var. **brunnea** (Forel).

Cremastogaster rasoherinæ var. *brunnea* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 79 (☿, ♀).

Type locality: Andranohinaly, Madagascar (Voeltzkow).

10. **Crematogaster sewellii** (Forel). See p. 844.

Cremastogaster inermis subsp. *sewellii* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 196 (☿), Pl. vi, fig. 9.

Cremastogaster sewellei Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 86. Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 138.

Type locality: Antananarivo, Imerina, Madagascar (Camboué).

Madagascar: Fianarantsoa (Besson).

10_1. Var. **improba** (Forel).

Cremastogaster sewelli var. *improba* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 80, footnote (☿).

Type locality: Morondava, Madagascar.

10a. Subsp. **dentata** (Forel).

Cremastogaster inermis subsp. *sewellii* var. *dentatus* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 196 (☿).

Cremastogaster sewellei var. *dentata* Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 86.

Cremastogaster sewelli subsp. *dentata* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 79.

Type locality: Madagascar (Grandidier).

Madagascar: Tulear, southwestern part (Voeltzkow).

10b. Subsp. **lobata** (Emery).

Crematogaster sewellei var. *lobata* Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 342 (☿).

Type locality: Diego Suarez, northern Madagascar (C. Alluaud).

10b_1. Var. **gigantea** (FOREL).

Cremastogaster sewelli subsp. *lobata* var. *gigantea* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 80, footnote (☿).

Type locality: Central MADAGASCAR.

10*c*. Subsp. **marnoi** (MAYR). See p. 844.

Cremastogaster sewelli subsp. *marnoi* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 79.

MADAGASCAR: Andranohinaly, southwestern part (Voeltzkow).

10*d*. Subsp. **mauritiana** (FOREL).

Cremastogaster sewelli subsp. *mauritiana* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 79 (☿).

Type locality: MAURITIUS (Voeltzkow).

11. **Crematogaster voeltzkowi** (FOREL).

Cremastogaster voeltzkowi FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 78 (☿).

Type locality: Anjouan, COMOROS (Voeltzkow).

Subgenus 2. **Orthocrema** SANTSCHI

12. **Crematogaster (Orthocrema) sordidula** (NYLANDER). See p. 850.

12$_1$. Var. **madecassa** EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 342 (☿, ♀).

Type locality: Diego Suarez, northern MADAGASCAR (C. Alluaud).

Subgenus 3. **Oxygyne** FOREL

13. **Crematogaster (Oxygyne) agnetis** (FOREL).

Cremastogaster agnetis FOREL, 1892, Ann. Soc. Ent. Belgique, XXXVI, pp. 531, 533, and 534 (☿, ♀, ♂).

Type locality: Amparafaravantsiv, MADAGASCAR (Sikora).

14. **Crematogaster (Oxygyne) emmæ** (FOREL).

Cremastogaster emma FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 227 (♀), Pl. VI, figs. 11 and 11*a*; 1892, Ann. Soc. Ent. Belgique, XXXVI, pp. 529, 534, and 535 (☿, ♀, ♂). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 81. WASMANN, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 107 and 111.

Crematogaster emmæ EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 286.

Cremastogaster (Oxygyne) emma FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (♀).

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

MADAGASCAR: Tamatave (Voeltzkow); Antongil Bay (Mocquerys).

14$_1$. Var. **laticeps** (FOREL).

Cremastogaster emma var. *laticeps* FOREL, 1892, Ann. Soc. Ent. Belgique, XXXVI, pp. 529, 534, and 535 (☿, ♀, ♂).

Type locality: Andrangóloaka Forest, MADAGASCAR (Sikora).

15. **Crematogaster (Oxygyne) inops** (FOREL).

Cremastogaster inops FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 254 (☿); 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 533 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 82.

Type locality: Anosibé, Bezanozano Province, MADAGASCAR (Sikora).

MADAGASCAR: Imerina (Sikora). NOSSI BÉ: (Sikora).

16. **Crematogaster (Oxygyne) marthæ** (Forel).

Cremastogaster marthæ Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, pp. 528 and 534 (☿, ♀).

Type locality: Amparafaravantsiv, Madagascar (Sikora).

17. **Crematogaster (Oxygyne) ranavalonis** (Forel).

Cremastogaster ranavalonis Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 388 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 84. Bergroth, 1903, Wien. Ent. Zeitg., XXII, p. 256.

Cremastogaster ranavalonæ Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 184 (☿, ♂), Pl. vi, figs. 3 and 4; 1892, Ann. Soc. Ent. Belgique, XXXVI, pp. 532 and 534 (☿, ♂); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿). Wm. M. Wheeler, 1910, 'Ants,' p. 215. H. Schmitz, 1915, Deutsch. Ent. Zeitschr., pp. 493 and 497.

Crematogaster ranavalonæ Emery, 1897, Bull. Soc. Ent. France, p. 13, figs. A and B (♀); 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 286.

Cremastogaster (Oxygyne) ranavalonæ Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 81 (☿).

Cremastogaster ranavalonæ var. *paulinæ-ranavalonæ* Wasmann, 1897, Zool. Anzeiger, XX, p. 249; 1897, Deutsch. Ent. Zeitschr., p. 258 (♀). Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188.

Type locality: Ivondrona near Tamatave, Madagascar (C. Keller).

Madagascar: eastern part (Humblot); Kalalo on Ile Sainte Marie (Perrot); Antongil Bay (Mocquerys); Fénérive (Voeltzkow). Comoros: Mayotte; Anjouan (Voeltzkow).

17a. Subsp. **paulinæ** (Forel).

Cremastogaster paulinæ Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 530 (☿); 1895, ibid., XXXIX, p. 488 (♀).

Cremastogaster ranavalonæ subsp. *paulinæ* Forel, 1903, ibid., XLVII, p. 254 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: central region (Sikora); Fort Dauphin.

Subgenus 4. Decacrema Forel

18. **Crematogaster (Decacrema) ensifera** (Forel).

Cremastogaster (Decacrema) ensifera Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 18 (☿).

Type locality: Sakana Forest, eastern Madagascar.

19. **Crematogaster (Decacrema) grevei** (Forel).

Cremastogaster grevei Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 183 (☿), Pl. vi, fig. 8. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 82.

Type locality: Morondava, western Madagascar (Grevé).

20. **Crematogaster (Decacrema) hova** (Forel).

Cremastogaster hova Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 387 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 180 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 82. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿). Mayr, 1901, Ann. Naturh. Hofmus. Wien, XVI, p. 14, footnote (nest).

Type locality: Ivondrona near Tamatave, Madagascar (C. Keller).

Nossi Bé: (Voeltzkow).

20$_1$. Var. **latinoda** (Forel).

Cremastogaster hova var. *latinoda* Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 535 (☿).

Type locality: Amparafaravantsiv, Madagascar (Sikora).

20a. Subsp. **nosibeensis** (Forel).

Cremastogaster hova subsp. *nosibeensis* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 181 (♀).

Cremastogaster nossibeensis Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 84.

Type locality: Nossi Bé: (O'Swald).

21. **Crematogaster (Decacrema) schenki** (Forel).

Cremastogaster schenki Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 182 (☿, ♀), Pl. vi, fig. 2. Wasmann, 1891, Stettin. Ent. Zeitg., LII, p. 1; 1893, Wien. Ent. Zeitg., XII, p. 257; 1893, Deutsch. Ent. Zeitschr., pp. 101, 104, 106, 107, and 108; 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' pp. 106, 107, 108, 109, 111, 131, 199, and 217. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 78 (☿).

Cremastogaster schenckii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 85.

Crematogaster schencki Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 336 and 343 (☿).

Crematogaster schenki Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 372 (☿, ♀).

Type locality: Antananarivo, Imerina, Madagascar.

Madagascar: Andrangoloaka (Camboué; Hildebrandt; Sikora); Diego Suarez (C. Alluaud); Sakana, eastern part (Voeltzkow); Amparafaravantsiv (Sikora).

Solenopsidini Emery

Vollenhovia Mayr

Vollenhovia Mayr, 1865, 'Reise Novara, Zool.,' II, Formicidæ, p. 21.

Genotype: *Vollenhovia punctatostriata* Mayr, 1865.

1. **Vollenhovia lævithorax** Emery, 1889, Ann. Mus. Civ. Genova, XXVII, p. 501 (☿).

Type locality: Tenasserim.

Borneo, Burma.

1a. Subsp. **alluaudi** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 68 (☿). Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93; 1912, ibid., XV, p. 162 (☿, ♀).

Type locality: Praslin, Seychelles (C. Alluaud).

Seychelles: Silhouette, Mare aux Cochons, 1000 ft. (H. M. Scott).

2. **Vollenhovia piroskæ** Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 162 (☿, ♂).

Type locality: Silhouette, Pointe Etienne, Seychelles (H. M. Scott).

Monomorium Mayr

Subgenus 1. Monomorium, *sensu stricto*

1. **Monomorium floricola** (Jerdon) Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿). See p. 863.

Réunion: (J. de Cordemoy). Aldabra Islands: (Voeltzkow).

2. **Monomorium fossulatum** Emery, 1894, Ann. Mus. Civ. Genova, XXXIV, p. 465 (☿).

Type locality: Rangoon, Burma (L. Fea).

2a. Subsp. **sechellense** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 69, fig. (☿). Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 163 (♀).

Monomorium fossulatum subsp. *seychellense* Forel, 1907, ibid., XII, p. 93.

Type locality: Ile Marie-Anne, Seychelles (C. Alluaud).

Seychelles: Silhouette, Mare aux Cochons, 1000 ft. (H. M. Scott).

3. **Monomorium minutum** Mayr. See p. 864.

3a. Subsp. **hildebrandti** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 256 (♀).

Monomorium hildebrandtii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 67.

Type locality: Central Madagascar (Hildebrandt).

3b. Subsp. **imerinense** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 257 (♀, ♂).

Monomorium imerinense Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 67.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

3c. Subsp. **madecassum** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 255 (☿, ♀, ♂); in Voeltzkow, 1907, 'Reise in Ostafrika,' VII, p. 77 (☿). See p. 864.

Monomorium minutum Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 164 (☿, ♀, ♂; *nec* Mayr).

Monomorium madecassum Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 67.

Type locality: Antananarivo, Imerina, Madagascar (Camboué).

Madagascar: Ankarimbelo, southeastern part; Andranohinaly, southwestern part (Voeltzkow).

4. **Monomorium pharaonis** (Linnæus) Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 163 (☿, ♀, ♂); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 280. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 91. See p. 866.

Madagascar: Morondava (Grevé); Antongil Bay (Mocquerys). Cerf Island: Providence (J. S. Gardiner). Juan de Nova Island, in the Strait of Mozambique: (Voeltzkow).

5. **Monomorium termitobium** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 522 (☿). Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 166.

Type locality: Amparafaravantsiv, Madagascar (Sikora).

Subgenus 2. **Xeromyrmex** Emery

6. **Monomorium (Xeromyrmex) salomonis** (Linnæus) Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿). See p. 870.

Nossi Bé: introduced (Voeltzkow).

Subgenus 3. **Parholcomyrmex** Emery

7. **Monomorium (Parholcomyrmex) gracillimum** (F. Smith). See p. 874.

7a. Subsp. **robustius** Forel, 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186. See p. 875.

Monomorium gracillimum subsp. *robustus* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 78 (☿).

MADAGASCAR: Majunga, western part; Andranohinaly, southwestern part (Voeltzkow).

Subgenus 4. **Isolcomyrmex** SANTSCHI

Monomorium subg. *Isolcomyrmex* SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), p. 296.

Subgenotype: *Holcomyrmex santschii* Forel, 1907.

8. **Monomorium (Isolcomyrmex) shuckardi** FOREL.

Monomorium shuckardi FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 251 (☿).

Type locality: Moramanga, Imerina, MADAGASCAR (Sikora).

Solenopsis WESTWOOD

1. **Solenopsis seychellensis** FOREL, 1909, Ann. Soc. Ent. Belgique, LIII p. 55 (☿); 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (☿, ♀).

Type locality: SEYCHELLES.

SEYCHELLES: Mahé; Silhouette, 1000–2000 ft. (H. M. Scott).

Oligomyrmex MAYR

1. **Oligomyrmex grandidieri** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 201 (♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 75. FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 249 (♂).

Type locality: Antananarivo, MADAGASCAR (Camboué).

MADAGASCAR: eastern Imerina (Sikora).

2. **Oligomyrmex voeltzkowi** FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 77 (♀).

Type locality: Tamatave, MADAGASCAR (Voeltzkow).

Aëromyrma FOREL

1. **Aëromyrma nosindambo** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 199 (♀, ♂), Pl. VI, fig. 1; 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 523 (♃, ☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 78. WASMANN, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 166.

Oligomyrmex (Aëromyrma) nosidambo SANTSCHI, 1919, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 339, fig. 3*n* (☿).

Type locality: Antananarivo, MADAGASCAR (Camboué).

MADAGASCAR: Amparafaravantsiv (Sikora).

Myrmecinini Ashmead

Terataner EMERY

1. **Terataner alluaudi** EMERY, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Atopomyrmex alluaudi EMERY, 1895, ibid., XXXIX, p. 341, fig. 2 (☿); 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 274. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 188 (☿). WASMANN, 1897, Zool. Anzeiger, XX, p. 250.

Type locality: Diego Suarez, northern MADAGASCAR (C. Alluaud).

MADAGASCAR: Antongil Bay (Mocquerys); Kalalo, Ile Sainte Marie (Perrot). NOSSI BÉ: (Voeltzkow).

2. **Terataner foreli** EMERY, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Atopomyrmex foreli EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 274, fig. (☿, ♂?).

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

3. **Terataner rufipes** EMERY, 1912, Ann. Soc. Ent. Belgique, LVI, p. 104 (☿).

Type locality: Fort Dauphin, MADAGASCAR (Sikora).

4. **Terataner scotti** (FOREL).

Atopomyrmex scotti FOREL, 1912, Trans. Linn. Soc. London, Zool., XV, p. 160 (♀, ♂?).

Terataner scoti EMERY, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Type locality: Praslin, SEYCHELLES (H. M. Scott).

SEYCHELLES: Silhouette, Mare aux Cochons, 1000 ft. (H. M. Scott).

5. **Terataner steinheili** (FOREL) EMERY, 1912, Ann. Soc. Ent. Belgique, LVI, p. 103.

Atopomyrmex steinheili FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 485 (☿).

Type locality: Central MADAGASCAR (Sikora).

Brunella FOREL

Brunella FOREL, 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 234.

Genotype: ***Aphænogaster belti*** **Forel, 1895.**

1. **Brunella belti** FOREL, 1917, Bull. Soc. Vaudoise Sc. Nat., (5) LI, p. 234.

Aphænogaster belti FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 248 (☿).

Atopula belti EMERY, 1915, Rend. Accad. Sc. Bologna, Sez. Sc. Nat., N. S., XIX, (1914–15), p. 68.

Type locality: Moramanga, MADAGASCAR (Sikora).

Meranoplini Emery

Meranoplus F. SMITH

1. **Meranoplus mayri** FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 19 (☿).

Type locality: Fort Dauphin, MADAGASCAR (Sikora).

2. **Meranoplus radamæ** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 148 (☿), Pl. IV, fig. 10. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 137.

Type locality: Imerina, central MADAGASCAR (Hildebrandt).

Leptothoracini Emery

Leptothorax MAYR

Subgenus **Goniothorax** EMERY

1. **Leptothorax (Goniothorax) latinodis** MAYR. See p. 891.

Leptothorax latinodis EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337.

COMOROS: Mayotte (C. Alluaud).

2. **Leptothorax (Goniothorax) madecassus** FOREL.

Leptothorax madecassus FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 265 (☿, ♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 125.

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

3. **Leptothorax (Goniothorax) retusispinosus** FOREL.

Leptothorax retusispinosus FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 267 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 126.

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

Tetramoriini Emery

Tetramorium MAYR

1. **Tetramorium guineense** (FABRICIUS) FOREL, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 150 (☿, ♀, ♂). EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 285. FOREL, 1907, Trans. Linn. Soc. London, Zool., XII, p. 91. See p. 896.

MADAGASCAR: Ivondrona near Tamatave (Keller); Antongil Bay (Mocquerys). CARGADOS ISLANDS: (J. S. Gardiner). RÉUNION: (C. Alluaud).

2. **Tetramorium quadrispinosum** EMERY. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿). See p. 900.

JUAN DE NOVA ISLAND in the Strait of Mozambique (Voeltzkow).

2a. Subsp. **montanum** (FOREL) SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 122 (☿).

Tetramorium blochmannii var. *montanum* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 153 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 131.

Tetramorium blochmanni subsp. *montanum* FOREL, 1912, Trans. Linn. Soc. London, Zool., XV, p. 160.

Type locality: Antananarivo, Imerina, MADAGASCAR (Camboué).

MADAGASCAR: Fianarantsoa, Betsileo (Besson). ALDABRA ISLANDS: (Fryer).

3. **Tetramorium sericeiventre** EMERY. See p. 900.

3a. Subsp. **blochmanni** (FOREL).

Tetramorium blochmannii FOREL, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 384 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 152 (☿), Pl. v, fig. 6. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 131. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿).

Tetramorium sericeiventre subsp. *blochmanni* SANTSCHI, 1918, Bull. Soc. Hist. Nat. Afr. Nord, IX, p. 124 (☿).

Type locality: Invondrona near Tamatave, MADAGASCAR (Keller).

NOSSI BÉ: (Voeltzkow).

4. **Tetramorium simillimum** (F. SMITH) FOREL, 1907, Trans. Linn. Soc. London, Zool., XII, p. 91. See p. 903.

AMIRANTES: Darros Island (J. S. Gardiner).

4_1. Var. **madecassum** FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 248 (☿).

Type locality: Imerina, MADAGASCAR (Sikora).

5. **Tetramorium tosii** EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 284, fig. (☿).

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

Xiphomyrmex Forel

1. **Xiphomyrmex andrei** (Forel).

Tetramorium (*Xiphomyrmex*) *andrei* Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 263 (☿).

Tetramorium andrei Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 130.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

1a. Subsp. **robustior** (Forel).

Tetramorium (*Xiphomyrmex*) *andrei* subsp. *robustius* Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 521 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

2. **Xiphomyrmex bessoni** (Forel).

Tetramorium (*Xiphomyrmex*) *bessonii* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 156 (☿), Pl. iv, figs. 13 and 13a.

Tetramorium bessonii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 131.

Type locality: Fianarantsoa, Betsileo, Madagascar (Besson).

2_1. Var. **orientalis** (Forel).

Tetramorium (*Xiphomyrmex*) *bessonii* var. *orientale* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 247 (☿).

Type locality: eastern Imerina, Madagascar (Sikora).

3. **Xiphomyrmex degener** (Santschi).

Tetramorium (*Yphomyrmex*) *degener* Santschi, 1911, Rev. Suisse Zool., XIX, p. 124 (☿).

Type locality: Madagascar.

4. **Xiphomyrmex humbloti** (Forel) Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 285 (☿, ♀). See p. 907.

Tetramorium (*Xiphomyrmex*) *humbloti* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 154 (☿), Pl. iv, fig. 12. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 83 (☿).

Tetramorium humblotii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 133.

Type locality: N'Gasiya, Grand Comoro (Humblot).

Madagascar: Antongil Bay (Mocquerys). Grand Comoro: (Voeltzkow).

5. **Xiphomyrmex kelleri** (Forel).

Tetramorium (*Xiphomyrmex*) *kelleri* Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 385 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 153 (☿), Pl. iv, fig. 11.

Tetramorium kelleri Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 134.

Type locality: Ivondrona near Tamatave, Madagascar (C. Keller).

6. **Xiphomyrmex latreillei** (Forel).

Tetramorium (*Xiphomyrmex*) *latreillei* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 247 (☿).

Type locality: eastern Imerina, Madagascar (Sikora).

7. **Xiphomyrmex marginatus** (Forel).

Tetramorium (*Xiphomyrmex*) *marginatum* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 485 (☿).

Type locality: Central Madagascar (Sikora).

8. **Xiphomyrmex nassonowi** (Forel).

Tetramorium (*Xiphomyrmex*) *nassonowii* Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 521 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

9. **Xiphomyrmex ranarum** (Forel).

Tetramorium (Xiphomyrmex) ranarum Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 486 (☿).

Type locality: Central Madagascar (Sikora).

10. **Xiphomyrmex schaufussi** (Forel).

Tetramorium (Xiphomyrmex) schaufussii Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 158 (☿); 1892, ibid., p. 263 (♀).

Tetramorium schaufussii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 134.

Type locality: Central Madagascar.

Madagascar: Andrangoloaka Forest (Sikora).

11. **Xiphomyrmex severini** Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 343 (☿); 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 285 (☿).

Type locality: Diego Suarez, Madagascar (C. Alluaud).

Madagascar: Antongil Bay (Mocquerys).

12. **Xiphomyrmex sikoræ** (Forel) Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336.

Tetramorium (Xiphomyrmex) sikoræ Forel, 1892, ibid., XXXVI, p. 522 (☿).

Xiphomyrmex sikorai Emery, 1895, ibid., XXXIX, p. 343 (♀).

Type locality: Amparafaravantsiv, Madagascar (Sikora).

Madagascar: Diego Suarez (C. Alluaud).

12a. Subsp. **xanthogaster** (Santschi).

Tetramorium (Xyphomyrmex) sikoræ subsp. *xantogaster* Santschi, 1911, Rev. Suisse Zool., XIX, p. 124 (☿).

Type locality: Madagascar.

13. **Xiphomyrmex steinheili** (Forel).

Tetramorium (Xiphomyrmex) steinheili Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 520 (☿, ♀).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Eutetramorium Emery

Eutetramorium Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 280.

Genotype: *Eutetramorium mocquerysi* Emery, 1900.

1. **Eutetramorium mocquerysi** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 281, fig. (☿).

Type locality: Antongil Bay, Madagascar (Mocquerys).

2. **Eutetramorium monticellii** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 283 (☿, ♀).

Type locality: Antongil Bay, Madagascar (Mocquerys).

Triglyphothrix Forel

1. **Triglyphothrix striatidens** (Emery). See p. 911.

1_1. Var. **felix** Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 160 (☿).

Type locality: Félicité, Seychelles (H. M. Scott).

Seychelles: Silhouette, Mare aux Cochons (H. M. Scott).

Cataulacini Emery

Cataulacus F. Smith

1. **Cataulacus ebrardi** Forel, 1886, Ann. Soc. Ent. Belgique, XXX, C. R. p. cv (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 145 (☿)' Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 336, 337, and 343 (☿). Mayr, 1895, Ann. Naturh. Hofmus. Wien, X, p. 129. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 20 (♀).

Cataulacus ebrardii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 138.

Type locality: Madagascar (Grandidier).

Madagascar: Morondava, eastern part (Grevé); Diego Suarez (C. Alluaud); Ambre Mountains, northern part. Nossi Bé: (C. Alluaud).

2. **Cataulacus johannæ** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 250 and 488 (☿, ♀).

Type locality: eastern Imerina, Madagascar (Sikora).

Madagascar: central part (Sikora).

3. **Cataulacus oberthüri** Emery, in Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 146 (☿), Pl. iv, fig. 9. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 138.

Cataulacus (*Otomyrmex*) *oberthüri* Forel, in Grandidier, 1891, 'Hi t. Phys. Nat. Madagascar,' XX, 2, p. 147; 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 488.

Cataulacus (*Otomyrmex*) *oberthueri* Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 286 (☿).

Type locality: Tamatave, Madagascar (Perrot).

Madagascar: Alahakato Forest (Perrot); 30 miles northwest of Tamatave; Antongil Bay (Mocquerys); central region (Sikora).

4. **Cataulacus porcatus** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 286 (☿, ♀).

Type locality: Antongil Bay, Madagascar (Mocquerys).

5. **Cataulacus regularis** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 252 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 139.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

6. **Cataulacus tenuis** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 288 (♀). Santschi, 1913, Ann. Soc. Ent. Belgique, LVII, p. 310 (☿).

Type locality: Antongil Bay, Madagascar (Mocquerys).

7. **Cataulacus voeltzkowi** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 84 (☿).

Type locality: Moheli, Comoros (Voeltzkow).

8. **Cataulacus wasmanni** Forel.

Cataulacus (*Otomyrmex*) *wasmanni* Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 193 (☿). Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 286 (☿).

Otomyrmex wasmanni Wasmann, 1897, Zool. Anzeiger, XX, p. 250.

Type locality: Kalalo, Ile Sainte Marie, Madagascar (Perrot).

Madagascar: Antongil Bay (Mocquerys).

Dacetonini Emery

Strumigenys F. Smith

Subgenus **Strumigenys,** *sensu stricto*

1. **Strumigenys godeffroyi** Mayr, 1866, Sitzb. Ak. Wiss. Wien, LIII, Abt. 1, p. 516 (☿); 1876, Journ. Mus. Godeffroy, XII, p. 113. Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 217 (☿). Mayr, 1887, Verh. Zool. Bot. Ges. Wien, XXXVII, p. 569 (☿, ♀). Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 188 and 189 (☿).

Type locality: Upolu, Samoa Islands.

Australia, Polynesian and Melanesian Islands.

Seychelles: (A. Brauer).

2. **Strumigenys grandidieri** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 517 (☿). Santschi, 1913, Bull. Soc. Ent. France, p. 259 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

3. **Strumigenys ludovici** Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903) p. 369 (☿). Santschi, 1913, Bull. Soc. Ent. France, p. 259 (☿).

Type locality: southern Madagascar (Sikora).

4. **Strumigenys scotti** Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 159 (☿).

Type locality: Silhouette, Mare aux Cochons, 1000 ft., Seychelles (H. M. Scott).

DOLICHODERINÆ Forel

Tapinomini Emery

Tapinoma Förster

Subgenus **Tapinoma,** *sensu stricto*

1. **Tapinoma melanocephalum** (Fabricius) Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 101 (☿). Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337. Forel, ibid., p. 49; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿); 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (☿, ♀).

Madagascar: Ivondrona near Tamatave (C. Keller); Diego Suarez (C. Alluaud). Seychelles: (Voeltzkow); Silhouette, Mare aux Cochons (H. M. Scott). Réunion: (J. de Cordemoy).

2. **Tapinoma subtile** Santschi, 1911, Rev. Suisse Zool., XIX, p. 125 (☿, ♂). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 41.

Type locality: south of Antongil, Madagascar.

Technomyrmex Mayr

1. **Technomyrmex aberrans** Santschi. Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 43.

Technomyrmex aberrant Santschi, 1911, Rev. Suisse Zool., XIX, p. 127 (♀).

Type locality: Fort Dauphin, Madagascar (C. Alluaud).

2. **Technomyrmex albipes** (F. Smith) Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿); 1909, Ann. Soc. Ent. Belgique, LIII, p. 55 (☿); 1912, Trans. Linn. Soc. London, Zool., XV, p. 164 (☿, ♀, ♂). See p. 925.

Réunion: (J. de Cordemoy). Seychelles: Silhouette, Mare aux Cochons and Mont Pot-à-Eau, 1000–1500 ft.; Mahé, Anonyme Island, Cascade Estate (H. M. Scott).

2a. Subsp. **foreli** Emery. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 187 (☿); 1907, Trans. Linn. Soc. London, Zool., XII, p. 92; 1912, ibid., XV, p. 164 (☿, ♀, ♂). See p. 926.

Technomyrmex albipes Forel, 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 98 (☿, ♀, ♂), Pl. iii, fig. 5; 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49 (*nec* Smith).

Type locality: Madagascar.

Madagascar: Ivondrona near Tamatave (Keller); Antananarivo; Ambavahaditokana, Imerina (Camboué); Angurutani, northwestern part (Voeltzkow). Nossi Bé: (Voeltzkow). Seychelles: Silhouette, Mare aux Cochons and Pot-à-eau; Mahé; Long Island (H. M. Scott).

3. **Technomyrmex madecassus** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 199 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Type locality: Nossi Bé (Voeltzkow).

3a. Var. **fusciventris** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Type locality: Moheli, Comoros (Voeltzkow).

4. **Technomyrmex mayri** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 99 (☿, ♂), Pl. iii, fig. 6. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 167. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 336; 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Type locality: 30 miles northwest of Tamatave, Madagascar (O'Swald).

Madagascar: Diego Suarez (C. Alluaud).

4a. Subsp. **difficilis** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 242 (☿, ♀); 1909, Ann. Soc. Ent. Belgique, LIII, p. 55 (☿). Emery, 1912, 'Gen. Insect., Dolichoderinæ,' p. 44.

Type locality: Anisobé, Bezanozano Province, Madagascar (Sikora).

Seychelles.

FORMICINÆ Lepeletier

Plagiolepidini Forel

Plagiolepis Mayr

Subgenus 1. Plagiolepis, *sensu stricto*

1. **Plagiolepis alluaudi** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71 (☿); 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49. Forel, 1907, Trans. Linn. Soc. London, XII, p. 92; 1912, ibid., XV, p. 165 (☿). See p. 928.

Type locality: La Misère, Mahé, Seychelles (C. Alluaud).

Réunion: (J. de Cordemoy). Seychelles: Silhouette, Mare aux Cochons; Félicité (H. M. Scott). Farquhar Islands: (J. S. Gardiner).

2. **Plagiolepis exigua** Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 245 (☿). See p. 929.

Madagascar: Moramanga (Sikora).

3. **Plagiolepis madecassa** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 519 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 173 Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71 (☿); 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337. Forel, ibid., p. 245 (♀, ♂); 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 388 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86 (☿); 1901, Trans. Linn. Soc. London, Zool., XII, p. 92; 1912, ibid., XV, p. 165 (☿).

Plagiolepis pygmæa subsp. *madecassa* Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 241 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: southern part, Imerina; Mangoro (Sikora); Andranohinaly; Ile Sainte Marie (Voeltzkow). Comoros: Mayotte (C. Alluaud). Seychelles: Mahé (C. Alluaud); Silhouette, Mare aux Cochons; Praslin; Anonyme Island; Félicité (H. M. Scott). Aldabra Islands: (Voeltzkow). Desroches Island: (J. S. Gardiner).

Subgenus 2. **Anoplolepis** Santschi

4. **Plagiolepis (Anoplolepis) longipes** (Jerdon). See p. 933.

Plagiolepis longipes Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49 (☿). E. Bordage, 1914, Bull. Scientif. France et Belgique, XLVII, (1913), p. 390.

Réunion: (J. de Cordemoy; E. Bordage); introduced from India.

5. **Plagiolepis (Anoplolepis) steingröveri** Forel. See p. 934.

5a. Subsp. **gertrudæ** Forel, 1900, Ann. Soc. Ent. Belgique, XLIV, p. 77.

Type locality: Réunion.

Acantholepis Mayr

1. **Acantholepis capensis** Mayr. Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 95 (☿, ♀, ♂). Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86 (☿). See p. 935.

Madagascar: Ile Sainte Marie (Voeltzkow). Nossi Bé: (C. Alluaud).

Myrmelachistini Forel

Brachymyrmex Mayr

Brachymyrmex Mayr, 1868, Ann. Soc. Nat. Modena, III, p. 163.

Genotype: *Brachymyrmex patagonicus* Mayr, 1868.

1. **Brachymyrmex cordemoyi** (Forel) Emery, 1905, Bull. Soc. Ent. Italiana, XXXVII, p. 179, figs. 37 and 39 (☿, ♂). Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 86 (☿).

Brachymyrmex patagonicus var. *cordemoyi* Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49 (☿). Emery, ibid., p. 337.

Brachymyrmex patagonicus subsp. *cordemoyi* Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 165 (☿, ♀, ♂).

Type locality: Réunion (J. de Cordemoy; C. Alluaud).

Seychelles: Mahé, Cascade Estate; Silhouette, Mare aux Cochons (H. M. Scott). Comoros: Moheli (Voeltzkow).

Argentina, whence it has been introduced into the Malagasy Region.

Prenolepidini Forel

Prenolepis Mayr

Subgenus **Nylanderia** Emery

1. **Prenolepis (Nylanderia) amblyops** Forel.

Prenolepis amblyops Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 240 (☿); 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 516 (♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 177. Emery, 1900, Bull. Soc. Ent. Italiana, XXXI (1899), p. 289, fig. (♂).

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Madagascar: Antananarivo; Amparafaravantsiv, Mangoro River (Sikora); Antongil Bay (Mocquerys).

1a. Subsp. **rubescens** Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 516 (☿).

Type locality: Amparafaravantsiv, Mangoro River, Madagascar (Sikora).

2. **Prenolepis (Nylanderia) bourbonica** Forel. See p. 941.

Prenolepis nodifera subsp. *bourbonica* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 210 (☿, ♀, ♂); 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿, ♀, ♂).

Prenolepis bourbonica Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 82 (☿, ♀, ♂), Pl. III, figs. 2 and 2*a*–*b*. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 178. Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 49 (☿); 1907, Trans. Linn. Soc. London, Zool., XII, p. 92; 1912, ibid., XV, p. 165 (♀, ♂).

Type locality: Saint-Denis, Réunion (C. Keller).

Seychelles: Mahé, Cascade Estate (H. M. Scott). Cargados: Siren Island (J. S. Gardiner). Coetivy: (J. S. Gardiner). Chagos Islands: (J. S. Gardiner).

2, Var. **farquharensis** Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 92 (☿).

Type locality: Farquhar Island (J. S. Gardiner).

2a. Subsp. **bengalensis** Forel, 1894, Journ. Bombay Nat. Hist. Soc., VIII, pp. 406 and 407 (☿, ♂).

Prenolepis bourbonica var. *bengalensis* Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71 (☿).

Prenolepis bengalensis Bingham, 1903, 'Fauna Brit. India, Hym.,' II, p. 328 (☿).

Type locality: Calcutta, India (Rothney).

India, Burma, Tenasserim. Seychelles: Mahé; La Digue; Ile Ronde (C. Alluaud).

2b. Subsp. **n'gasiyana** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 87 (☿).

Type locality: Grand Comoro (Voeltzkow).

3. **Prenolepis (Nylanderia) comorensis** Forel.

Prenolepis comorensis Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 87 (☿).

Type locality: Dzialandsi, Anjouan, Comoros, 800 m. (A. Voeltzkow).

4. **Prenolepis (Nylanderia) glabra** Forel.

Prenolepis glabra Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 92 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 178.

Type locality: central Madagascar (Schaufuss).

5. **Prenolepis (Nylanderia) gracilis** Forel.

Prenolepis gracilis Forel, 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 517 (☿).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

6. **Prenolepis (Nylanderia) humbloti** (Forel).

Prenolepis braueri subsp. *humbloti* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 90 (☿, ♀, ♂), Pl. II, figs. 11 and 11*a–d*.

Prenolepis humblotii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 178. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿).

Prenolepis humbloti Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337.

Type locality: Forests of Madagascar (Humblot).

Madagascar: Tamatave (A. Voeltzkow); Imerina (Hildebrandt); Diego Suarez (C. Alluaud).

7. **Prenolepis (Nylanderia) longicornis** (Latreille). See p. 941.

Prenolepis longicornis Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 210 (☿, ♀); 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382 (☿, ♀); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 81 (☿, ♀, ♂), Pl. II, figs. 8 and 8*a–b*; 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228; 1895, ibid., XXXIX, p. 49 (☿). Emery, ibid., p. 337. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 187 (☿); 1907, Trans. Linn. Soc. London, Zool., XII, p. 92; 1912, ibid., XV, p. 165 (☿).

Madagascar: Majunga, western part; Angurutani, northwestern part (Voeltzkow). Nossi Bé: (C. Keller; C. Alluaud; Voeltzkow). Coetivy: (J. S. Gardiner). Aldabra Island: (Fryer; Voeltzkow). Réunion: (J. de Cordemoy).

8. **Prenolepis (Nylanderia) madagascarensis** Forel.

Prenolepis vividula var. *madagascarensis* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 212 (☿).

Prenolepis vividula subsp. *madagascariensis* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 87 (☿).

Prenolepis madagascariensis Forel, 1892, ibid., p. 238 (♀, ♂). Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71, fig. a (☿).

Prenolepis madagascarensis Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 179.

Type locality: central Madagascar (Hildebrandt).

Madagascar: Betsileo (Hildebrandt); Imerina (Sikora). Nossi Bé: (C. Keller).

8_1. Var. **rufescens** (Forel).

Prenolepis ellisi subsp. *madagascariensis* var. *rufescens* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿).

Type locality: Ile Sainte Marie, Madagascar (Voeltzkow).

8_2. Var. **sechellensis** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 71, fig. *b* (☿).

Prenolepis madagascariensis var. *seychellensis* Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93.

Type locality: Mahé, Seychelles (C. Alluaud).

8a. Subsp. **ellisi** (Forel).

Prenolepis ellisii Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 87 (☿, ♀, ♂), Pl. II, figs. 10 and 10*a–d*; 1892, Ann. Soc. Ent. Belgique, XXXVI, p. 516 (☿, ♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 178. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (♀); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿).

Type locality: Antananarivo, Imerina, Madagascar (Camboué).

Madagascar: Analamainty Forest, Imerina (Camboué); Tamatave (O'Swald); Fianarantsoa (Besson); Imerina (Hildebrandt); Ankarimbelo, southeastern part; Fénérive (Voeltzkow); Amparafaravantsiv; Mangoro River (Sikora). Nossi Bé: (Voeltzkow).

9. **Prenolepis (Nylanderia) mixta** Forel.

Prenolepis mixta Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 203, fig. 3 (☿, ♂); 1912, Trans. Linn. Soc. London, Zool., XV, p. 165 (☿, ♀, ♂).

Type locality: Seychelles (A. Brauer).

Seychelles: Silhouette, 2000 ft.; Mahé; Praslin (H. M. Scott).

10. **Prenolepis (Nylanderia) sikoræ** Forel.

Prenolepis sikoræ Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 238 (♀, ♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 180.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

11. **Prenolepis (Nylanderia) steinheili** Forel.

Prenolepis steinheili Forel, 1893, Trans. Ent. Soc. London, p. 342 (☿); 1912, Trans. Linn. Soc. London, Zool., XV, p. 165 (☿).

Prenolepis nodifera Forel, 1881, Mitth. Münch. Ent. Ver., V, p. 2 (☿; *nec* Mayr).

Type locality: St. Thomas, West Indies (Steinheil).

Aldabra Island: (Fryer); imported from the Antilles.

Camponotini Forel

Camponotus Mayr

Subgenus 1. **Camponotus**, *sensu stricto*

1. **Camponotus (Camponotus) gallieni** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus (Myrmoturba) gallienii Forel, 1916, Rev. Suisse Zool., XXIV, p. 457.

Camponotus concolor Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 214 (☿), Pl. vi, fig. 12. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 226. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771. Forel, 1914, Rev. Suisse Zool., XXII, p. 266. (*nec C. alii* var. *concolor* Forel, 1890).

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Subgenus 2. **Myrmoturba** Forel

2. **Camponotus (Myrmoturba) hagensi** Forel, 1914, Rev. Suisse Zool., XXII, p. 267.

Camponotus rubripes subsp. *hagensii* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 158 (☿, ♀).

Camponotus maculatus subsp. *hagensii* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 27 and 74 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768.

Camponotus hagensii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 233. Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 244 (♀, ♂).

Camponotus (Myrmoturba) hagensi Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: central Madagascar (Hildebrandt; Sikora).

Madagascar: eastern Imerina (Sikora).

3. **Camponotus (Myrmoturba) maculatus** (Fabricius). See p. 949.

3_1. Var. **lividior** Santschi, 1911, Rev. Suisse Zool., XIX, p. 128 (☿, ♀, ♂).

Type locality: Grand Comoro (H. Pobeguin).

3a. Subsp. **boivini** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 34 (☿, ♀), 75, and 213 (☿, ♀, ♂). Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 92 (☿, ♀).

Camponotus boivinii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 223.

Type locality: Madagascar (Boivin).

Madagascar: Diego Suarez (C. Alluaud); Imerina (Sikora). Seychelles: Mahé, 1800 ft. (J. S. Gardiner). Chagos Islands: (J. S. Gardiner).

3b. Subsp. **fairmairei** Santschi, 1911, Rev. Suisse Zool., XIX, p. 130, figs. 3b and 3e (☿).

Type locality: Madagascar (Fairmaire).

3c. Subsp. **fulvus** Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 72 (☿, ♀); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 92 (☿, ♀).

Type locality: Praslin, Seychelles (C. Alluaud).

Chagos Islands: (J. S. Gardiner).

$3c_1$. Var. **octonotatus** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 202 (☿, ♀). Emery, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 225. Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 93 (☿, ♀); 1912, ibid., XV, p. 165 (☿, ♀, ♂).

Type locality: Seychelles (A. Brauer).

Seychelles: Mahé, 1600–1800 ft.; Praslin (J. S. Gardiner); Silhouette (H. M. Scott).

3d. Subsp. **hova** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 35 and 74 (☿, ♀), Pl. i, fig. 5; 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228. Emery, 1895, ibid., XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿).

Camponotus hova Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 235. Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Camponotus maculatus subsp. *radamæ* var. *hova* Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿, ♀).

Type locality: Morondava, Madagascar (Grevé).

Madagascar: (Grandidier); Antongil Bay (Mocquerys); Lake Alaotra; Andranohinaly; north Mahafaly; Majunga (Voeltzkow); Diego Suarez (C. Alluaud). Island Juan de Nova in the Strait of Mozambique: (Voeltzkow).

$3d_1$. Var. **hova-hovoides** (Forel) Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768.

Camponotus hova-hovoides Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 232 (☿, ♀, ♂).

Camponotus hova var. *hova-hovoides* Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 235.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

$3d_2$. Var. **luteolus** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 202 (☿). Emery, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 225. Santschi, 1911, Rev. Suisse Zool., XIX, p. 131, fig. 3g (☿).

Type locality: Majunga, Madagascar (Voeltzkow).

$3d_2$. Var. **maculatoides** FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 200 (☿). EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 225. FOREL, 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿).[1]

Type locality: Nossi Bé (Voeltzkow).

MADAGASCAR: (Kiderlen).

$3e$. Subsp. **legionarius** SANTSCHI, 1911, Ann. Soc. Ent. Belgique, LV, p. 283 (☿).

Type locality: Diego Suarez, MADAGASCAR.

$3f$. Subsp. **radamæ** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 31 and 74 (☿), Pl. I, fig. 4. EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 131, fig. 3a (☿). FOREL, 1914, Rev. Suisse Zool., XXII, p. 267; 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 250 (☿).

Camponotus radamæ DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249. EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Camponotus (Myrmoturba) radamæ EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Type locality: Ivondrona near Tamatave, MADAGASCAR (C. Keller).

MADAGASCAR: northeastern part (Humblot); Diego Suarez (C. Alluaud); Antongil Bay (Mocquerys). COMOROS: Mayotte (C. Alluaud).

$3f_1$. Var. **becki** FOREL, 1914, Bull. Soc. Vaudoise Sc. Nat., (5) L, p. 251 (☿).

Type locality: MADAGASCAR (R. Beck).

$3f_2$. Var. **hovoides** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 33 and 74 (☿, ♀). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿).

Camponotus radamæ var. *hovoides* DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249.

Camponotus maculatus subsp. *hova* var. *hovoides* SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 131, fig. 3f (☿).

Type locality: Tamatave, MADAGASCAR (Camboué).

MADAGASCAR: Ile aux Prunes; eastern part (Voeltzkow); Antananarivo, Imerina (Hildebrandt).

$3f_3$. Var. **mixtellus** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 33 and 74 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿, ♀); 1912, Trans. Linn. Soc. London, Zool., XV, p. 165 (☿, ♀, ♂); 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (☿).

Camponotus radamæ var. *mixtellus* DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249. WASMANN, 1893, Deutsch. Ent. Zeitschr., p. 109; 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 107.

Type locality: MADAGASCAR.

MADAGASCAR: Ile aux Prunes; Diego Suarez (Friederichs). ALDABRA ISLANDS: (Voeltzkow; Fryer).

$3f_4$. Var. **obscuratus** FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿, ♂).

Type locality: EUROPA ISLAND in the Strait of Mozambique (A. Voeltzkow).

MADAGASCAR: Tulear, southwestern part (A. Voeltzkow).

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[1] Santschi (1921) raises this form to specific rank and transfers it to *Dinomyrmex*.

3g. Subsp. **radamoides** (FOREL) SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), pp. 292 and 293 (☿). See p. 958.

Camponotus maculatus var. *radamoides* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 213 (☿).

Camponotus maculatus subsp. *radama* var. *radamoides* SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 131, fig. *3d* (☿).

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

$3g_1$. Var. **madecassus** (EMERY) SANTSCHI, 1917, Ann. Soc. Ent. France, LXXXV, (1916), pp. 292 and 293 (☿). See p. 959.

Camponotus maculatus subsp. *liocnemis* var. *madecassa* EMERY, 1905, Rend. Accad. Sc. Bologna, N. S., IX, p. 30, footnote (☿).

Camponotus maculatus FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 29 and 74 (☿, ♀, ♂); 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 228; 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 187 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿, ♀, ♂).

Camponotus maculatus subsp. *atramentarius* var. *madecassa* FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 88 (☿, ♀, ♂); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿).

Type locality: MADAGASCAR.

MADAGASCAR: Majunga, western part; Lake Alaotra (Voeltzkow). NOSSI BÉ: (C. Keller; O'Swald; Voeltzkow). COMOROS: N'Gasiya on the Grand Comoro (Humblot); Moheli; Anjouan (Voeltzkow).

3h. Subsp. **strangulatus** SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 129, fig. *3c* (☿, ♀).

Type locality: Adampy near Vohemar, MADAGASCAR (Grandidier).

MADAGASCAR: Vitikanpy, Morondava (Grandidier).

4. **Camponotus** (**Myrmoturba**) **perroti** FOREL, 1914, Rev. Suisse Zool., XXII, p. 267. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 255.

Camponotus perroti FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 202 (☿). WASMANN, 1897, Zool. Anzeiger, XX, p. 250. EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 225.

Type locality: Kalalo, Ile Sainte Marie, east coast of MADAGASCAR (Perrot).

4_1. Var. **æschylus** FOREL.

Camponotus (*Dinomyrmex*) *perroti* var. *æschylus* FOREL, 1913, Deutsch. Ent. Zeitschr., Beih., p. 224 (♀).

Type locality: MADAGASCAR (C. Keller).

5. **Camponotus** (**Myrmoturba**) **rœseli** FOREL, 1914, Rev. Suisse Zool., XXII, p. 267.

Camponotus rœseli FOREL, 1910, Ann. Soc. Ent. Belgique, LIV, p. 20 (☿).

Type locality: Ambre Mts., northern MADAGASCAR.

Subgenus 3. **Dinomyrmex** ASHMEAD

6. **Camponotus** (**Dinomyrmex**) **cervicalis** ROGER. FOREL, 1914, Rev. Suisse Zool., XXII, p. 268. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus cervicalis ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 134 (☿); 1863, 'Verzeich. Formicid.,' p. 2. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 458. FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 19

and 75 (☿, ♀, ♂), Pl. I, figs. 3 and 3a. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 224. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Type locality: Madagascar.

Madagascar: eastern forests (Humblot); Antongil Bay (Mocquerys). Nossi Bé: (Réveillé; O'Swald).

7. **Camponotus (Dinomyrmex) dufouri** Forel, 1914, Rev. Suisse Zool., XXII, p. 268; 1918, Bull. Soc. Vaudoise Sc. Nat., (5) LII, p. 155 (♀). Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus dufouri Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 16 and 74 (☿), Pl. I, figs. 2 and 2*a-d*. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Forel, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 244 (♀) and 488 (♂). Emery, ibid., p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188. Wasmann, 1897, Zool. Anzeiger, XX, p. 250. Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Type locality: Tamatave, Madagascar (Perrot).

Madagascar: Diego Suarez (C. Alluaud); Kalalo, Ile Sainte Marie; Alahakato (Perrot); Antongil Bay (Mocquerys); central part (Sikora); Ile Sainte Marie (Voeltzkow); Ile aux Prunes near Tamatave (Friederichs).

7₁. Var. **imerinensis** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 18 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768.

Type locality: Antananarivo, Madagascar (Camboué).

8. **Camponotus (Dinomyrmex) gaullei** Santschi.

Camponotus gaullei Santschi, 1911, Rev. Suisse Zool., XIX, p. 128 (☿).

Type locality: Antongil Bay, Madagascar.

9. **Camponotus (Dinomyrmex) gouldi** Forel, 1914, Rev. Suisse Zool., XXII, p. 268. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Camponotus egregius subsp. *gouldi* Forel, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. civ (☿); ibid., p. 167 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 22 and 75 (☿).

Camponotus gouldi Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 233. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 201 (☿, ♀); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (♃); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90 (☿, ♂).

Type locality: Madagascar (Grandidier).

Madagascar: Majunga; Tulear, southwestern part; Andranohinaly; north Mahafaly (Voeltzkow); Androhomana (Sikora).

10. **Camponotus (Dinomyrmex) hildebrandti** Forel, 1914, Rev. Suisse Zool., XXII, p. 268.

Camponotus hildebrandti Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 161 (☿, ♀); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 14 and 74 (☿, ♀), Pl. I, fig. 1 and Pl. III, fig. 1. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 235. Wasmann, 1894, 'Verzeichn. Myrmecoph. Termitoph. Arthrop.,' p. 173. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 768; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Camponotus (*Dinomyrmex*) *hildebrandi* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 256.

Type locality: central MADAGASCAR (Hildebrandt).

MADAGASCAR: Betsileo (Hildebrandt); Imerina (Camboué); Antongil Bay (Mocquerys).

Subgenus 4. **Myrmosericus** FOREL

11. **Camponotus** (**Myrmosericus**) **aurosus** ROGER. FOREL, 1914, Rev. Suisse Zool., XXII, p. 268.

Camponotus aurosus ROGER, 1863, Berlin. Ent. Zeitschr., VII, p. 134 (☿); 1863, 'Verzeich. Formicid.,' p. 2. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 458. FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar, XX, 2, pp. 36 and 74 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 222. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 770.

Camponotus (? *Myrmepomis*) *aurosus* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: MAURITIUS.

Subgenus 5. **Myrmosaulus** WHEELER

Camponotus subg. *Myrmosaulus* WM. M. WHEELER, 1921, Psyche, XXVIII, p. 18.

Camponotus subg. *Myrmosphincta* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 238 (not of Forel, 1912).

Subgenotype: *Formica cinerascens* Fabricius, 1787.

12. **Camponotus** (**Myrmosaulus**) **batesi** FOREL.

Camponotus batesii FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 243 (☿).

Camponotus batesi EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (*Dinomyrmex*) *batesi* FOREL, 1914, Rev. Suisse Zool., XXII, p. 268.

Camponotus (*Myrmosphincta*) *batesi* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Type locality: Moramanga, eastern Imerina, MADAGASCAR (Sikora).

Subgenus 6. **Myrmosaga** FOREL

Camponotus subg. *Myrmosaga* FOREL, 1912, Mém. Soc. Ent. Belgique, XX, p. 92; 1914, Rev. Suisse Zool., XXII, p. 260. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 241.

Subgenotype: *Camponotus kelleri* Forel, 1886 (Wheeler, 1913); *C. quadrimaculatus* Forel, 1886 (Forel, 1914).

13. **Camponotus** (**Myrmosaga**) **cambouei** FOREL. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus cambouei FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 68 and 71 (☿), Pl. I, fig. 13 and Pl. II, fig. 6. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 223. EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 357; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (*Camponotus*) *cambouei* FOREL, 1914, Rev. Suisse Zool., XXII, p. 266.

Type locality: Antananarivo, Imerina, MADAGASCAR (Camboué).

MADAGASCAR: Diego Suarez (C. Alluaud).

14. **Camponotus (Myrmosaga) christi** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus christi Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 184 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 63 and 72 (☿), Pl. I, fig. 12. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 224. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Camponotus (Myrmocamelus) christi Forel, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: central Madagascar (Hildebrandt).

Madagascar: Imerina; Betsileo region (Hildebrandt; Camboué); Antongil Bay (Mocquerys).

14_1. Var. **ambustus** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 233 (☿, ♀). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 224. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

Madagascar: Anosibé (Sikora).

14_2. Var. **ferrugineus** Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290 (☿).

Type locality: Antongil Bay, Madagascar (Mocquerys).

14_3. Var. **maculiventris** Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 344 (☿, ♀); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771. Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 21.

Type locality: Diego Suarez, northern Madagascar (C. Alluaud).

Madagascar: Ambre Mountains, in the northern part.

14*a*. Subsp. **fœrsteri** Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 185 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 64 and 72 (☿).

Camponotus forsteri Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 231.

Camponotus christi var. *fœrsteri* Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Type locality: central Madagascar (Hildebrandt).

Madagascar: Imerina; Betsileo country (Hildebrandt); Analamainty Forest Antananarivo (Camboué).

15. **Camponotus (Myrmosaga) dromedarius** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus dromedarius Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 65 and 72 (☿), Pl. II, fig. 5. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus (Myrmocamelus) dromedarius Forel, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: Imerina, Madagascar (Camboué).

Madagascar: Analamainty Forest near Antananarivo (Camboué).

15_1. Var. **pulcher** Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 234 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 229. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, pp. 337 and 344 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. Forel, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (☿).

Type locality: Anosibé, Imerina, Madagascar (Sikora).

Madagascar: Ronomafana (Sikora); Diego Suarez (C. Alluaud).

16. **Camponotus (Myrmosaga) kelleri** Forel, 1914, Rev. Suisse Zool., XXII, p. 269. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus kelleri Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 186 (☿); 1887, Mitth. Schweiz. Ent. Ges., VII, p. 381 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 62 and 72 (☿), Pl. II, fig. 4. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 236. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿).

Type locality: Ivondrona near Tamatave, Madagascar (C. Keller).

Nossi Bé: (C. Alluaud; Voeltzkow).

16$_1$. Var. **invalidus** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 200 (☿). Emery, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 226.

Type locality: Nossi Bé (Voeltzkow).

17. **Camponotus (Myrmosaga) lubbocki** Forel, 1914, Rev. Suisse Zool., XXII, p. 269. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus lubbocki Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 186 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 60 (☿, ♀), 73, and 216 (☿), Pl. I, fig. 11. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Camponotus lubbockii Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 240.

Type locality: central Madagascar (Hildebrandt).

Madagascar: Antananarivo, Imerina (Hildebrandt; Camboué); Andrangoloaka Forest (Sikora); Fénérive; Tamatave; Andranohinaly; Ile Sainte Marie (Voeltzkow).

17$_1$. Var. **rectus** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 217 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 240. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Type locality: Andrangoloaka, Madagascar (Sikora).

17a. Subsp. **christoides** Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 61 and 73 (☿). Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus christoides Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 224.

Type locality: Mt. Lokobé, Nossi Bé (O'Swald).

18. **Camponotus (Myrmosaga) pictipes** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus pictipes Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 217 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 247. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus (Myrmocamelus) pictipes Forel, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: Andrangoloaka Forest, Madagascar (Sikora).

19. **Camponotus (Myrmosaga) quadrimaculatus** Forel, 1914, Rev. Suisse Zool., XXII, p. 269. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus quadrimaculatus Forel, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. cii (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 58 and 72 (☿, ♀, ♂), Pl. II, fig. 3. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 249. Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Type locality: MADAGASCAR (Grandidier).

MADAGASCAR: Fianarantsoa in the Betsileo country (Besson); Diego Suarez (C. Alluaud). COMOROS: Grand Comoro; Mayotte (Voeltzkow).

19_3. Var. **immaculatus** FOREL, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 233 (☿, ♀). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Type locality: Andrangoloaka Forest, MADAGASCAR (Sikora).

MADAGASCAR: Tamatave (Voeltzkow).

19_2. Var. **opacus** EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290 (☿).

Type locality: Antongil Bay, MADAGASCAR (Mocquerys).

19a. Subsp. **sellaris** EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 344, fig. 3 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Type locality: Diego Suarez, MADAGASCAR (C. Alluaud).

Subgenus 7. **Mayria** FOREL

Mayria FOREL, 1878, Bull. Soc. Vaudoise Sc. Nat., (2) XV, p. 369; in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 75.

Camponotus subg. *Mayria* EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. FOREL, 1914, Rev. Suisse Zool., XXII, p. 262.

Subgenotype: *Camponotus repens* Forel = *Mayria madagascariensis* Forel, 1886.

20. **Camponotus (Mayria) repens** FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 187 (☿); 1914, Rev. Suisse Zool., XXII, p. 270. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Mayria madagascarensis FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. civ (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 219.

Mayria madagascariensis FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 75 (☿), Pl. II, figs. 7 and 7a; 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 227 (☿).

Camponotus (Mayria) madagascariensis EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus repens EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 226.

Type locality: MADAGASCAR (Grandidier).

MADAGASCAR: Majunga, northern part (Voeltzkow).

Subgenus 8. **Myrmonesites** EMERY

Camponotus subg. *Myrmonesites* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 242.

Subgenotype: *Camponotus putatus* Forel, 1892.

21. **Camponotus (Myrmonesites) heteroclitus** FOREL. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus heteroclitus FOREL, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 243 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (☿).

Calomyrmex heteroclitus FOREL, 1914, Rev. Suisse Zool., XXII, p. 274.

Type locality: Ambohimalazaba, eastern Imerina, MADAGASCAR (Sikora).

MADAGASCAR: Ranomafana (Sikora).

22 **Camponotus (Myrmonesites) leveillei** Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus leveillei Emery, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 344 (☿); 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Camponotus (Myrmobrachys) leveillei Forel, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: Nossi Bé.

23. **Camponotus (Myrmonesites) mocquerysi** Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus mocquerysi Emery, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 289, fig. (☿).

Camponotus (Orthonotomyrmex) mocquerysi Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Antongil Bay, Madagascar (Mocquerys).

24. **Camponotus (Myrmonesites) putatus** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus putatus Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 234 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 249. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290 (☿).

Calomyrmex putatus Forel, 1914, Rev. Suisse Zool., XXII, p. 275.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

Madagascar: Antongil Bay (Mocquerys).

25. **Camponotus (Myrmonesites) reaumuri** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus reaumuri Forel, in Grandidier, 1892, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 236 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 249. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus (Myrmosphincta) reaumuri Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Anosibé, Bezanozano Province, Madagascar (Sikora).

26. **Camponotus (Myrmonesites) sikorai** Emery, 1920, Rev. Zool. Afr., VIII, 2, pp. 242, fig., and 257 (♀).

Type locality: Fort Dauphin, Madagascar (Sikora).

Subgenus 9. **Myrmopytia** Emery

Camponotus subg. *Myrmopytia* Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 243.

Subgenotype: *Camponotus imitator* Forel, 1891.

27. **Camponotus (Myrmopytia) imitator** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 257.

Camponotus imitator Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 209 (☿), Pl. iv, fig. 15 and Pl. v, fig. 8. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 235. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772. Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿).

Camponotus (Myrmosphincta) imitator Forel, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Tulear, Madagascar (Grandidier).

Madagascar: Morondava (Grevé); Imanombo, southern part (Voeltzkow).

27a. Var. **resinicolus** SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 133 (☿).
Type locality: Andrahomana, southern MADAGASCAR (C. Alluaud).
MADAGASCAR: Ambolisatra (G. Grandidier).

Subgenus 10. **Orthonotomyrmex** ASHMEAD

28. **Camponotus (Orthonotomyrmex) edmondi** ERN. ANDRÉ. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.[1]

Camponotus edmondi ERN. ANDRÉ, 1887, Rev. d'Ent. Caen, VI, p. 281 (☿). FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 49 and 71 (☿), Pl. I, fig. 7. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290. FOREL, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿).

Camponotus edmondii DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 229.

Camponotus (Myrmobrachys) edmondi FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: Tamatave, MADAGASCAR.

MADAGASCAR: 30 miles northwest of Tamatave (O'Swald); Ile Sainte Marie (Voeltzkow); Antongil Bay (Mocquerys).

28a. Var. **ernesti** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 50 and 71 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774; 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Camponotus edmondii var. *ernestii* DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 229.

Type locality: 30 miles northwest of Tamatave, MADAGASCAR (O'Swald).

MADAGASCAR: Antongil Bay (Mocquerys).

29. **Camponotus (Orthonotomyrmex) ethicus** FOREL, 1914, Rev. Suisse Zool., XXII, p. 273. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.[2]

Camponotus ethicus FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 200 (♀, ♂). EMERY, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227.

Type locality: Sakatia, near Nossi Bé, MADAGASCAR (Voeltzkow).

30. **Camponotus (Orthonotomyrmex) robustus** FOREL, 1914, Rev. Suisse Zool., XXII, p. 273. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.[3]

Camponotus robustus ROGER, 1863, Berlin. Ent. Zeitschr., VI, p. 135 (☿); 1863, 'Verzeich. Formicid.,' p. 2. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 459. ERN. ANDRÉ, 1882, 'Spec. Hym. Eur. Algérie,' II, p. 148 (☿). FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, p. 187 (☿); 1887, Mitth. Schweiz. Ent. Ges., VII, p. 381 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 54 and 71 (☿), Pl. I, fig. 10. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 250. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775. WASMANN, 1897, Zool. Anzeiger, XX, p. 250. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188. EMERY, 1900, Bull. Soc. Ent. Italiana, XXXI, (1899), p. 290.

Type locality: MADAGASCAR.

MADAGASCAR: eastern forests (Humblot); Ivondrona near Tamatave (C. Keller); Kalalo, Ile Sainte Marie (Perrot); Antongil Bay (Mocquerys).

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[1] Placed by Santschi (1921) in his subgenus *Myrmisolepis*.
[2] Placed by Santschi (1921) in his subgenus *Myrmisolepis*.
[3] Placed by Santschi (1921) in his subgenus *Myrmisolepis*.

31. **Camponotus (Orthonotomyrmex) sericeus** (Fabricius). See p. 973.

Camponotus sericeus Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 56 and 71 (☿, ♀, ♂).

Mauritius.

32. **Camponotus (Orthonotomyrmex) sibreei** Forel. Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus sibreei Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 53 and 72 (☿), Pl. I, fig. 9. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 252. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774.

Camponotus (Myrmobrachys) sibreei Forel, 1914, Rev. Suisse Zool., XXII, p. 271.

Type locality: 30 miles northwest of Tamatave, Madagascar (O'Swald).

Subgenus 11. **Myrmotrema** Forel

33. **Camponotus (Myrmotrema) foraminosus** Forel. See p. 978.

33a. Subsp. **aldabrensis** Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 203 (☿). Emery, 1898, Rend. Accad. Sc. Bologna, N. S., II, p. 227. Santschi, 1911, Rev. Suisse Zool., XIX, p. 133 (☿). Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 166 (☿, ♀, ♂).

Camponotus (Myrmotrema) auropubens subsp. *aldabrensis* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 267 and 275 (☿).

Type locality: Aldabra Islands (Voeltzkow; Fryer).

Comoros: Grand Comoro (H. Pobeguin).

$33a_1$. Var. **fryeri** Forel, 1912, Trans. Linn. Soc. London, Zool., XV, p. 166 (☿).

Camponotus (Myrmotrema) olivieri subsp. *freyeri* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 270.

Type locality: Aldabra Islands (Fryer).

33*b*. Subsp. **ruspolii** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90. See p. 981.

Nossi Bé: (Voeltzkow).

$33b_1$. Var. **rotundatus** Forel, in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 90 (☿).

Camponotus (Myrmotrema) grandidieri subsp. *ruspolii* var. *rotundata* Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, p. 269 (☿).

Type locality: Ile Sainte Marie, Madagascar (Voeltzkow).

34. **Camponotus (Myrmotrema) grandidieri** Forel. See p. 981.

Camponotus grandidieri Forel, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. ciii (☿); ibid., p. 187 (☿); 1887, Mitth. Schweiz. Ent. Ges., VII, p. 382; in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 39 and 73 (☿), Pl. I, fig. 6; 1892, ibid., p. 232 (♂). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 233. Emery, 1894, Ann. Soc. Ent. France, LXIII, p. 72 (☿); 1895, Ann. Soc. Ent. Belgique, XXXIX p. 337. Wasmann, 1897, Zool. Anzeiger, XX, p. 250. Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 188 (☿). Emery, 1900, Bull. Soc. Ent Italiana, XXXI, (1899), p. 290. Forel, 1909, Ann. Soc. Ent. Belgique, LIII, p. 55.

Camponotus foraminosus subsp. *grandidieri* Forel, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186, 187, and 188 (☿); 1907, Mitt. Naturh. Mus. Hamburg.

XXIV, p. 14 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿, ♀, ♂); 1912, Trans. Linn. Soc. London, XV, p. 166 (☿, ♀, ♂).

Camponotus foraminosus var. *grandidieri* Forel, 1907, Trans. Linn. Soc. London, Zool., XII, p. 92 (☿, ♀, ♂).

Type locality: Madagascar (Grandidier).

Madagascar: Ile Sainte Marie; Lake Alaotra (Voeltzkow); Antongil Bay (Mocquerys); Kalalo, Ile Sainte Marie (Perrot); Diego Suarez (C. Alluaud). Nossi Bé: (C. Keller; C. Alluaud; Voeltzkow). Seychelles: Chateau Margot, 1600 ft., Mahé (J. S. Gardiner); Silhouette; Cascade Estate, 800–1000 ft., Mahé (H. M. Scott). Aldabra Islands: (Voeltzkow). Farquhar Island: (J. S. Gardiner). Comoros: Anjouan; Moheli; Grand Comoro (Voeltzkow). Europa Island in the Strait of Mozambique: (Voeltzkow).

34_1. Var. **atrabilis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 269 and 273 (☿). See p. 982.

Type locality: Ile Sainte Marie, Madagascar (Voeltzkow).

Madagascar: Diego Suarez (Grandidier).

34_2. Var. **comorensis** Santschi, 1915, Ann. Soc. Ent. France, LXXXIV, pp. 269 and 274 (☿).

Type locality: Grand Comoro (H. Pobeguin).

Subgenus 12. **Myrmopiromis** Wheeler

35. **Camponotus (Myrmopiromis) darwini** Forel.

Camponotus darwinii Forel, 1886, Ann. Soc. Ent. Belgique, XXX, p. 179 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 43 and 73 (☿), Pl. II, fig. 1. Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 228. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus (Myrmobrachys) darwinii Forel, 1914, Rev. Suisse Zool., XXII, p. 270.

Camponotus (Myrmepomis) darwini Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: central Madagascar (Hildebrandt).

35a. Subsp. **rubropilosus** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 165.

Camponotus darwinii var. *rubropilosus* Forel, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 44 and 73 (☿). Dalla Torre, 1893, 'Cat. Hym.,' VII, p. 228. Emery, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Type locality: forest of Analamainty, northeast of Antananarivo, Madagascar (Camboué).

$35a_1$. Var. **robustior** Forel, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 165 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 92 (☿).

Type locality: Madagascar.

Madagascar: Tulear, southwestern part (Voeltzkow).

35*b*. Subsp. **themistocles** (Forel) Santschi, 1911, Rev. Suisse Zool., XIX, p. 133 (☿).

Camponotus themistocles Forel, 1910, Ann. Soc. Ent. Belgique, LIV, p. 456 (☿).

Camponotus (Myrmepomis) themistocles Emery, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Fort Dauphin, Madagascar (Sikora).

Madagascar: Andrahomana, southern part (C. Alluaud).

36. **Camponotus (Myrmopiromis) ellioti** FOREL.

Camponotus ellioti FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 37 and 73 (☿). EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. FOREL, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 74 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (♃); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿). SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 133 (☿).

Camponotus elliotii DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 229.

Camponotus (Myrmepomis) ellioti FOREL, 1914, Rev. Suisse Zool., XXII, p. 273. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: MADAGASCAR (Scott Elliot).

MADAGASCAR: Andrahomana (Sikora; C. Alluaud); Tulear; north Mahafaly (Voeltzkow); Fort Dauphin.

36_1. Var. **relucens** SANTSCHI, 1911, Rev. Suisse Zool., XIX, p. 133 (☿).

Type locality: Fort Dauphin, MADAGASCAR (C. Alluaud).

37. **Camponotus (Myrmopiromis) niveosetosus** MAYR. See p. 986.

Camponotus niveosetosus FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 41 and 73 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 89 (☿).

GRAND COMORO: (Voeltzkow).

37a. Subsp. **madagascarensis** FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. civ (☿).

Camponotus niveosetosus var. *madagascariensis* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 42 and 73 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 245. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus niveosetosus subsp. *madagascariensis* FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, pp. 186 and 187 (☿); 1907, Mitt. Naturh. Mus. Hamburg, XXIV, p. 14 (☿).

Type locality: Betsileo, Fianarantsoa, MADAGASCAR (Besson).

MADAGASCAR: (Grandidier; Kiderlen); Majunga (Voeltzkow). NOSSI BÉ: (Voeltzkow).

38. **Camponotus (Myrmopiromis) nossibeënsis** ERN. ANDRÉ.

Camponotus nossibeensis ERN. ANDRÉ, 1887, Rev. d'Ent. Caen, VI, p. 281 (☿). FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 48 and 73 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 245. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 186 (☿); in Voeltzkow, 1907, 'Reise in Ostafrika,' II, p. 91 (☿).

Camponotus (Myrmobrachys) nossibeensis FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Camponotus (Myrmepomis) nossibensis EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: NOSSI BÉ (Voeltzkow).

MADAGASCAR: (Scott Elliot); Tulear, southwestern part (Voeltzkow).

39. **Camponotus (Myrmopiromis) radovæ** FOREL.

Camponotus radovæ FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. civ (☿); ibid., p. 178 (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 45 and 73 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249. EMERY, 1895, Ann. Soc. Ent. Belgique, XXXIX, p. 337; 1896, Mem. Accad. Sc. Bologna, (5) V, p 775.

Camponotus (Myrmobrachys) radovæ FOREL, 1914, Rev. Suisse Zool., XXII, p. 271.

Camponotus (Myrmepomis) radovæ EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: MADAGASCAR (Grandidier).

MADAGASCAR: Antananarivo, Imerina (Hildebrandt); Morondava (Grevé); Diego Suarez (C. Alluaud).

39_1. Var. **radovæ-darwini** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 46 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 249. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Type locality: Imerina, MADAGASCAR (Sikora).

40. **Camponotus (Myrmopiromis) ursus** FOREL.

Camponotus ursus FOREL, 1886, Ann. Soc. Ent. Belgique, XXX, C. R., p. ci (☿); in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 46 and 73 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 255. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus (Myrmobrachys) ursus FOREL, 1914, Rev. Suisse Zool., XXII, p. 271.

Camponotus (Myrmepomis) ursus EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: MADAGASCAR (Grandidier).

41. **Camponotus (Myrmopiromis) voeltzkowi** FOREL.

Camponotus völtzkowii FOREL, 1894, Ann. Soc. Ent. Belgique, XXXVIII, p. 226 (☿); 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (☿).

Camponotus voelzkowi EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 775.

Camponotus voeltzkowi FOREL, 1897, Abhandl. Senckenberg. Naturf. Ges., XXI, p. 208 (☿).

Camponotus (Myrmobrachys) voltzkowi FOREL, 1914, Rev. Suisse Zool., XXII, p. 271.

Camponotus (Myrmepomis) voeltzkowi EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Type locality: Majunga, MADAGASCAR (Voeltzkow).

MADAGASCAR: Androhomana (Sikora).

Subgenus 13. **Myrmepinotus** SANTSCHI

Camponotus subg. *Myrmepinotus* SANTSCHI, 1921, Ann. Soc. Ent. Belgique, LXI, p. 312.

Subgenotype: *Camponotus echinoploides* Forel, 1891.

42. **Camponotus (Myrmepinotus) echinoploides** FOREL.

Camponotus echinoploides FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 51 and 71 (☿), Pl. I, fig. 8. DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 229. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 774. FOREL, 1904, Ann. Mus. Zool. Ac. Sc. St. Pétersbourg, VIII, (1903), p. 377 (☿).

Camponotus (Myrmobrachys) echinoploides FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Camponotus (Myrmacantha) echinoploides EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 258.

Camponotus (*Myrmepinotus*) *echinoploploides* SANTSCHI, 1921, Ann. Soc. Ent. Belgique, LXI, p. 312.

Type locality: 30 miles northwest of Tamatave, MADAGASCAR (O'Swald).

MADAGASCAR: Ranomafana (Sikora).

Subgenus 14. **Colobopsis** MAYR

43. **Camponotus** (**Colobopsis**) **cylindricus** (FABRICIUS) EMERY, 1889, Ann. Mus. Civ. Genova, XXVII, p. 517. FOREL, 1914, Rev. Suisse Zool., XXII, p. 272. EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 259.

Formica cylindrica FABRICIUS, 1798, 'Suppl. Ent. Syst.,' p. 280 (♀). LATREILLE, 1802, 'Hist. Nat. Fourmis.,' p. 121 (♀), Pl. IV, fig. 19. COQUEBERT, 1804, 'Illustr. Iconogr. Ins.,' III, p. 95 (♀), Pl. XXI, fig. 12. FABRICIUS, 1804, 'Syst. Piez.,' p. 404 (♀). F. SMITH, 1858, 'Cat. Hym. Brit. Mus.,' VI, p. 15.

Colobopsis cylindrica ROGER, 1863, 'Verzeich. Formicid.,' p. 9. MAYR, 1863, Verh. Zool. Bot. Ges. Wien, XIII, p. 403. FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 77 (♀).

Camponotus cylindricus DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 227.

Recorded from INDIA and MAURITIUS, but not seen since Fabricius and Latreille. Emery (1917, Bull. Soc. Ent. France, p. 97) identifies with this species *Camponotus doriæ* Mayr, from Borneo and Sumatra.

Species Incertæ Sedis

44. **Camponotus butteli** FOREL, 1905, Ann. Soc. Ent. Belgique, XLIX, p. 164 (☿).

Camponotus (*Myrmocamelus*) *butteli* FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Type locality: MADAGASCAR.

Related to *C. nasicus* Forel.

45. **Camponotus gibber** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, p. 215 (☿), Pl. VI, fig. 13; 1892, ibid., p. 232 (♀, ♂). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 232. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 772.

Camponotus quadrimaculatus var. *gibber* FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 59 and 72 (☿).

Camponotus (*Myrmosphincta*) *gibber* FOREL, 1914, Rev. Suisse Zool., XXII, p. 273.

Type locality: Imerina, MADAGASCAR (Camboué; Sikora).

MADAGASCAR: Andrangoloaka Forest; Anosibé (Sikora).

46. **Camponotus nasicus** FOREL, in Grandidier, 1891, 'Hist. Phys. Nat. Madagascar,' XX, 2, pp. 67 and 72 (☿). DALLA TORRE, 1893, 'Cat. Hym.,' VII, p. 244. EMERY, 1896, Mem. Accad. Sc. Bologna, (5) V, p. 771.

Camponotus (*Myrmocamelus*) *nasicus* FOREL, 1914, Rev. Suisse Zool., XXII, p. 270.

Camponotus (subgenus?) *nasica* EMERY, 1920, Rev. Zool. Afr., VIII, 2, p. 252.

Type locality: Fianarantsoa, Betsileo country, MADAGASCAR.

47. **Camponotus thomasseti** FOREL, 1912, Trans. Linn. Soc. London, Zool., XV, p. 166 (☿, ♂).

Camponotus (*Myrmamblys*) *thomasseti* FOREL, 1914, Rev. Suisse Zool., XXII, p. 272.

Type locality: Cascade Estate, 1000 ft., Mahé, SEYCHELLES (H. M. Scott).

SEYCHELLES: Silhouette, Mare aux Cochons (H. M. Scott).

Polyrhachis bihamata (Drury) = *Formica bihamata* Drury, 1773, 'Illustr. Nat. Hist.,' II, Pl. XXXVIII, figs. 7 and 8 (☿), was originally described from Johanna Island, one of the Comoros. As pointed out by Forel in 1907, this was probably a mistake in the labelling of the type specimen, since this common East Indian ant has never been found again in the Malagasy Region and since the genus *Polyrhachis* is otherwise not represented there.

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